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ARITHMETIC BY GRADES

KRAMPNER AND GRADY

SEVENTH YEAR

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ARITHMETIC BY GRADES

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SEVENTH YEAR



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E. G AR. BY GR. — SEVENTH YEAR
W. P. I

TO THE TEACHER WHO USES THIS BOOK

This book covers the topics usually studied in the seventh year.

Its main purposes are (*a*) to develop habits of speed and accuracy and (*b*) to give insight into the ordinary activities of the home, school, and business, which involve applications of arithmetic.

The first aim is accomplished by means of many drills, reviews, and speed tests, as well as by frequent reminders of common sources of error and suggestions as to how to avoid them.

The second purpose is fulfilled by presenting the business and social applications of arithmetic in settings which pupils can easily understand. The experiences which the pupils will encounter both in and out of business life call for a systematic method of keeping personal accounts and for a certain amount of practical knowledge concerning trade discount, profit and loss, commission, taxes and duties, interest, commercial paper, exchange, etc. The aim of this book is not to make the pupils experts in complicated technical computations but rather to give them definite concepts of the business situations to which the arithmetical applications are made. At the same time enough exercises are provided to develop skill in the handling of the simpler problems to which such situations give rise.

The topical arrangement facilitates reviews and lends itself readily to the placing of the chief emphasis on the points in which the pupils of any given class are found to be weakest.

The number games and related problems add interest to the work.

To the many teachers and friends who have given helpful advice and suggestions the authors make grateful acknowledgment.

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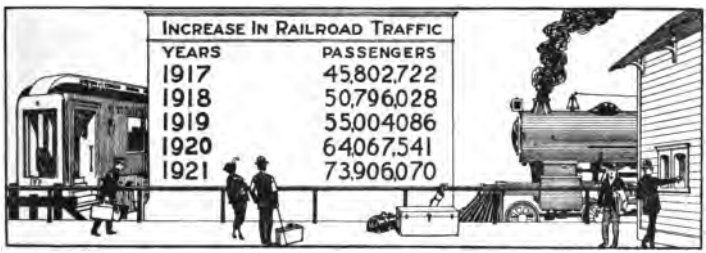
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SEVENTH YEAR — FIRST HALF



REVIEW

Notation and Numeration

1. Name three different ways in which numbers can be expressed.

2. Can you recall the rules you have learned about reading numbers?

3. When do we use " and " in reading numbers?

4. What is usually done to help us in reading large numbers?

5. Read the numbers in the picture.

6. What is the difference in value between the place to the left of the decimal point and the place to the right of the decimal point?

7. Do Roman numbers have place value?

☞ *Be careful to read and write numbers accurately, as many mistakes are often due to incorrect reading or careless writing of numbers.*

Read the following and write the numbers in words:

8. On June 30, 1920, according to the Treasury report, the total debt of the United States was $24,299,321,467.07.

9. This amount was $2,297,380,180.94 less than the total debt on August 31 of the previous year.

10. The population of the United States in 1920 was 105,683,108.

11. At the beginning of the World War the national wealth of the United States was estimated at $250,000,000,000; that of Great Britain, at $90,000,000,000.

Read the following, and write the numbers in figures:

12. Four billion one hundred seventy-six million five hundred sixteen thousand eight hundred fifty dollars were subscribed to the Third Liberty Loan.

13. The World War cost three hundred thirty-eight billion dollars.

14. Write the following in words: 845,621,324, 75,689,432,164, 40,067,621,893, 17,623,451,682.

15. Read: 827,063, 961,687,542, 1,078,562,169, 30,189,765,425.

NOTE. In reading and writing decimals remember that there are as many decimal places as there are 0's in the denominator. Thus, forty-five thousandths ($\frac{45}{1000}$) is written .045. (There are three 0's in the denominator 1000.)

Read:

	a	*b*	*c*
16.	3.75	16.008	5.016
17.	300.006	.306	.186925
18.	.0009	500.005	.8016

Write decimally:

19. 64 ten-thousandths.

20. 503 thousandths.

21. Four thousandths.

22. Eighty-two millionths.

23. Five hundred eight thousandths.

24. Six and three hundred-thousandths.

Write in words:

	a	*b*	*c*
25.	200.006	.0875	26.75
26.	8.0007	.526	.05275
27.	.321654	8.2	.041275

28. Move the decimal point one place to the right in all the numbers in examples 25, 26, and 27 and read the resulting numbers.

29. Move the decimal point one place to the left in all the numbers in examples 25, 26, and 27 and read the resulting numbers.

30. How do you determine the number of decimal places when writing the following decimally?

$\frac{9}{100000}$ $\frac{8}{100}$ $\frac{6}{10}$ $\frac{4}{1000000}$

31. How do you determine the denominator when reading any decimal as a common fraction?

32. What name is given to the third decimal place? the second? the fifth? the first? the fourth?

$$.8 = .80 = .800 = .8000$$

$$\frac{8}{10} = \frac{80}{100} = \frac{800}{1000} = \frac{8000}{10000}$$

Reading the examples toward the right shows that if we multiply the numerator and the denominator by the same number, we change the denomination but not the value.

Reading the examples from right to left shows that if we divide the numerator and the denominator by the same number, we change the denomination but not the value.

33. Write as hundredths: .9, 0.6, .4, 0.7.

34. Write as thousandths: .9, .06, .05, .7.

35. Express as tenths: 0.700, 0.50, 0.800, .90.

36. How many letters does the Roman system of notation make use of?

37. Write the Roman numbers from 1 to 25 in their order.

38. Read: LX, XIX, XC, LVI, CCV, MD, MCCV, XL, MDCIX, $\overline{\text{MC}}$.

39. Write the present year in Roman numbers.

40. Write the year of your birth in Roman numbers.

41. Write in Roman numbers:

a. The year the Battle of the Marne was fought.

b. The year we entered the World War.

c. The year Washington was born.

d. The year Lincoln was assassinated.

42. Write in Roman notation: 16, 24, 58, 112, 502, 1718.

Read these statements:

43. Charles Dickens was born in MDCCCXII.

44. Henry W. Longfellow died in MDCCCLXXXII.

☞ *Remember:*

Business men require boys and girls who are able to read numbers correctly, to copy them correctly, to write them from dictation, and to add, subtract, multiply, and divide integers and fractions *accurately* with *reasonable* speed. *Accuracy* is more important than speed. To insure accuracy, try to:

1. Write figures carefully, particularly when writing in column form.
2. Write units under units, tens under tens, etc.
3. Check every calculation before laying down your pencil.
4. Prove your answer whenever you have a chance to do so.

FUNDAMENTAL OPERATIONS

Addition and Subtraction

[Without pencil]

Practice giving the sums and the differences of the following until you can give all in less than two minutes:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
1.	15	13	7	22	16	24	9	31
	8	5	6	9	7	8	7	7
2.	44	33	36	25	18	24	46	35
	8	8	9	8	9	6	8	9

Practice stating the sums, and then the differences, until you can give all in less than two minutes:

3.	32	24	36	42	21	45	23	61
	16	15	18	17	16	36	14	27
4.	54	42	73	85	96	27	62	43
	37	15	24	17	19	18	18	26

Give the sums at once:

	a	*b*	*c*
5.	8, 9, and 15	3, 7, and 12	9, 15, and 4
6.	12, 5, and 15	21, 17, and 5	15, 18, and 2

Read the answers quickly:

7.	Add .6 and .012	Add .08 and .8	Add .7 and .4
8.	1.8+.009= ?	9+.07+.03= ?	From .8 take .3
9.	From .9 take .5	From .35 take .05	From 4.6 take .04

Give the differences (in less than one minute) between:

	a	*b*	*c*
10.	9 and 16	16 and 7	27 and 19
11.	14 and 8	52 and 12	35 and 70
12.	9 and 24	54 and 16	27 and 36

Tell the missing numbers:

	Minuend	Subtrahend	Difference or Remainder
13.	26	17	?
14.	36	?	19
15.	?	24	18
16.	61	29	?
17.	?	45	16
18.	60	?	24
19.	?	33	19
20.	64	?	15
21.	31	14	?
22.	?	36	24

Find the change in each of the following:

	Sum Given	Amount of Purchase	Change
23.	$2.00	$.76	?
24.	1.00	.38	?
25.	5.00	1.54	?
26.	5.00	2.60	?
27.	.50	.19	?

Example: Add: 27, 19, 32, 46

Say: Work

46+30+2+10+9+20+7=124, *Ans.*

Or,

46+2+30+9+10+7+20=124, *Ans.*

Add, without using pencil or paper:

	a	*b*	*c*	*d*	*e*
28.	16	38	21	53	38
	24	54	76	29	19
	37	62	84	36	27
	84	76	38	45	64
	92	85	46	41	32
	17	94	54	37	39

29. Give the sums without using pencil or paper:

67	99	58	48	79
38	39	96	59	72
27	76	25	76	38
64	54	18	89	45
49	39	39	92	59
51	87	46	46	63

☞ *Check all additions by adding in the opposite direction.*

Thus, add downward after adding upward, or add from right to left after adding from left to right.

☞ *Check all subtractions by adding the difference to the subtrahend,* to note whether the sum thus obtained is the same as the minuend.

1. Find the sums: [With pencil]

a	*b*	*c*	*d*
387	4,016	3,109	15,786
40,164	984	876	316,985
892	15,376	19,217	7,621,976
78	8,492	8,624	3,899
5,214	976	937	485,421
65,938	57,848	85	69,764
9,876	894	9,764	8,376,927

Find the sum of:

2. 31,876, 18, 365, 1,760,197, 5,234,695, and 76,219,765.

3. 19,765,249, 37,689, 457,652, 5,764,321, and 7,596,-321,406.

Solve the following:

4. 4625+106,752+59,648+4009+58+60,765+952,126= ?

5. Add seventy-eight thousand four hundred nine, sixteen million three hundred fifteen thousand nine hundred fifty-four, and two hundred nineteen thousand four hundred eight.

6. Add upwards and crosswise:

	a	*b*	*c*	*d*
e.	$ 3,189.16 +	$3176.58 +	$ 197.65 +	$ 1,589.75
f.	57,018.98 +	2710.85 +	3765.89 +	36,219.29
g.	789.47 +	476.23 +	897.15 +	16,789.14
h.	3,169.23 +	98.78 +	217.28 +	4,537.36
i.	54,567.19 +	2576.28 +	98.56 +	8,929.76

7. Add three hundred forty and six hundredths, five hundred sixty ten-thousandths, eight hundred and four thousandths, and eight hundred five thousandths.

8. Subtract and test:

a	*b*	*c*	*d*
1,697,845	31,376,582	87,612,321	37,621,915
389,796	19,698,793	49,659,947	18,762,749

Find the remainders:

	a	*b*
9.	3,167,652−398,765	8,560,005−875,629
10.	20,000,003−6,876,542	8,100,300−796,378

Find the balance in each bank:

	Deposits	Amounts Withdrawn	Balance
11.	\$6761.20, \$276.15	\$1789.27, \$1072.29, \$763.75	?
12.	\$3765.82, \$176.25	\$ 689.25, \$ 399.76, \$987.25	?
13.	\$4370.56, \$462.15	\$ 389.76, \$1021.28, \$876.45	?

14. From 52 subtract 7.09; 4.0076; 15.01235; .67542.

15. From 1567.025 subtract $356\frac{1}{2}$; $989.02\frac{1}{2}$; $784\frac{3}{4}$; 276.00875.

16. What number must be added to 49,866 to produce 900,004?

17. Add upwards and also crosswise:

	a		*b*		*c*		*d*
e.	317,654	+	396,784	+	296,156	+	37,625
f.	19,859	+	623,849	+	98,704	+	9,789
g.	7,639	+	87,549	+	3,716	+	58,764
h.	189,543	+	58	+	2,765,419	+	178,546
i.	91,076	+	3,176,587	+	458,007	+	32,169

☞ *Do you always check your work?*

Subtract each of the following numbers from 40,000:

18. 3769	**27.** 322.9	**36.** 322.76	**45.** 1.7605
19. 39,189	**28.** 189.076	**37.** 27.64	**46.** 32.008
20. 689	**29.** 318.7	**38.** 18.013	**47.** 409.315
21. 61.7	**30.** 43.125	**39.** .0076	**48.** 5.0219
22. 157.18	**31.** 159.16	**40.** 1976.1	**49.** 67.056
23. 5432	**32.** 147.15	**41.** 48.96	**50.** 5030.4
24. 467.05	**33.** 5.0097	**42.** 5789.1	**51.** 4005.1
25. 7189	**34.** 9764.3	**43.** 5.1376	**52.** 324.28
26. 1423.8	**35.** 76.327	**44.** 485.37	**53.** 25.642

Multiplication

Give the products quickly: [Without pencil]

	a	*b*	*c*
1.	6×9	six 9's	10×35
2.	8×7	eight 6's	100×620
3.	9×9	four 12's	1000×38
4.	4×15	12 elevens	90×9
5.	7×7	seven 9's	50×60
6.	4×8	eleven 11's	80×25

7. Use 8, 9, 12, 7, and 10 as multipliers in turn, and the numbers in the box as multiplicands. Give the products only. See whether you can give all products in less than two minutes:

7, 12, 11, 8, 6, 10, 30, 4, 9, 5, 3, 50

Give the products of:

	a	*b*	*c*	*d*
8.	3, 8, and 5	6, 12, and 2	4, 5, and 8	4, 3, and 5
9.	4, 4, and 4	5, 2, and 6	3, 3, and 3	9, 3, and 3
10.	5, 5, and 3	8, 3, and 4	9, 2, and 5	6, 4, and 2

Give the products quickly:

	a	*b*	*c*	*d*
11.	.05×10	.7×6	8.7×100	.05×8
12.	100×.06	3.006×100	8×.04	1000×.5

☞ *Remember:*

I. To multiply one decimal by another, multiply as with integers, and then from the right of the product point off as many decimal places as there are decimal places in both multiplicand and multiplier.

8.4, multiplicand	.008, multiplicand
.3, multiplier	.007, multiplier
2.52, product	.000056, product

II. To multiply by 10, move the decimal point *one* place to the right; to multiply by 100, move the decimal point *two* places to the right; to multiply by 1000, move the decimal point *three* places to the right; and so on.

Thus, $10\times.8=8$; $10\times8.=80$.
$100\times.08=8$; $100\times8.=800$.
$1000\times.08=80$; $1000\times8.=8000$.

	a	*b*
13.	$100\times50=?$	$1000\times75=?$
14.	$1000\times35=?$	$100\times2.005=?$
15.	$100\times.5=?$	$1000\times3.25=?$
16.	$1000\times1.25=?$	$100\times.2=?$
17.	$10\times.005=?$	$1000\times.06=?$

Give the products:

18.	$.5\times.6$	$.005\times.5$
19.	$.9\times.12$	$.12\times.07$
20.	$.08\times.6$	$2.5\times.3$
21.	$.4\times.07$	$3.2\times.5$
22.	$.06\times.06$	$.5\times.5$

Find the products: [With pencil]

	a	*b*	*c*
1.	15×346	89×405	105×762
2.	234×5967	$898\times17,682$	1008×3876
3.	6257×184	$157\times357,645$	897×6367
4.	$187,563\times1006$	458×1768	86×4765

Find the products:

	a	*b*	*c*
5.	.0876×175	85.106×180	3.0165×105
6.	76.055×725	.075×1625	875×.156
7.	16.05×1482	9.015×3765	3.012×4216
8.	19.075×1875	8.6×163.12	.56×1397.56
9.	12.3×4875.1	.035×1.068	.065×817.65
10.	.0475×156.50	.875×2.25	.64×9.205
11.	.0148×2.5	.015× 1275.30	.068×17.058

Find the product of:

12. Four thousand and six thousandths.

13. Two thousand four and two hundred four thousandths.

14. Four hundred four thousandths and four hundred-thousandths.

Division

1. Give the quotients quickly: [Without pencil]

72÷8	56÷7	108÷9
60÷5	48÷8	32÷4
96÷8	5400÷10	35÷7
132÷12	27÷9	84÷12
81÷9	64÷8	121÷11

2. Give the answers rapidly:

76÷12=—— and —— remainder
49÷ 6=—— and —— remainder
53÷ 8=—— and —— remainder
44÷ 6=—— and —— remainder
87÷12=—— and —— remainder
25÷ 4=—— and —— remainder

3. Give the answers rapidly:

$37 \div 5 =$ —— and —— remainder
$68 \div 7 =$ —— and —— remainder
$51 \div 9 =$ —— and —— remainder
$130 \div 11 =$ —— and —— remainder
$29 \div 3 =$ —— and —— remainder
$61 \div 9 =$ —— and —— remainder

4. Give the missing numbers:

Dividend	Divisor	Quotient
64	?	8
81	9	?
?	7	8
42	6	?
63	?	9
150	?	50
120	10	?
?	12	12
75	?	15
?	7	12

☞ *Remember:*

I. To divide a decimal by an integer, divide as with integers, placing the decimal point in the quotient *directly over the decimal point in the dividend.*

3.04, quotient
Divisor, 8)24.32, dividend

II. To divide a decimal by a decimal, move the decimal point in both the divisor and the dividend toward the right as many places as there are decimal figures in the divisor. Then divide as in division of a decimal by an integer.

2 235.
.012.)26.820.

III. To divide a number by 10 or any multiple of 10, move the decimal point *in the dividend* as many places *to the left* as there are 0's in the divisor, cancel the 0's in the divisor, and then divide by the remaining number.

$$3.\not{0}\not{0}\overline{)}.25\not{/}5 \qquad .085$$

Give the quotients:

	a	*b*
5.	.8÷4	3.2÷8
6.	.36÷9	.063÷7
7.	2.8÷7	.0144÷12
8.	8.1÷9	.096÷8
9.	64÷.8	84÷.12
10.	320÷.4	56÷.07
11.	160÷.2	42÷.06
12.	45÷.9	72÷.08
13.	.18÷.6	.96÷1.2
14.	1.6÷2	.064÷.8
15.	3.2÷.08	3.6÷.03
16.	4.5÷.9	8.4÷1.2
17.	4.8÷.06	.032÷.04
18.	.09÷3	.054÷6

☞ *Prove your answers whenever time permits. Always check every calculation before dropping your pencil.*

Find the quotients: [With pencil]

	a	*b*
1.	715,762÷57	15,865÷37
2.	14,386÷28	570,447÷241

Find the quotients:

	a	*b*
3.	48,228 ÷ 46	197,124 ÷ 204
4.	297,693 ÷ 93	975,103 ÷ 165
5.	508,573 ÷ 98	1,239,540 ÷ 146
6.	903.5052 ÷ 26	469 ÷ .175
7.	924.42 ÷ 42	1720 ÷ .16
8.	671.18 ÷ 37	5430 ÷ 7.5
9.	321.6 ÷ 15	258 ÷ 1.72
10.	432.682 ÷ 94	3836 ÷ .035
11.	1.048 ÷ .64	378.084 ÷ .84
12.	1260 ÷ 2.52	22.4 ÷ .072
13.	7.376 ÷ 64	798.19 ÷ 9.5
14.	602.14 ÷ 1.19	29.841 ÷ .15
15.	898.56 ÷ 41.6	4506.39 ÷ 42
16.	3757.5 ÷ .25	167.86 ÷ 154
17.	82.732 ÷ .052	2011.4 ÷ 1.78
18.	4500 ÷ .0072	349.734 ÷ 4.62
19.	784.5 ÷ 375	671.18 ÷ 3.7
20.	2.739 ÷ 13.2	4326.82 ÷ .094

Give the quotients, using pencil when necessary:

21.	3.976 ÷ 100	1632 ÷ 800
22.	.875 ÷ 100	1253 ÷ 70
23.	.0658 ÷ 100	59.6 ÷ 80
24.	486 ÷ 200	68.405 ÷ 50

25. What is the effect of crossing off a zero at the right of a whole number?

26. What is the effect of crossing off a zero at the right of a decimal?

MISCELLANEOUS PROBLEMS [With pencil]

☞ *Do not forget to check all work to test the correctness of your answers.*

1. The coal production of the world one year was as follows: United States, 569,960,120 tons; Great Britain, 321,992,130 tons; British Colonies, 58,177,385 tons; Continental Europe, 482,158,105 tons; all other countries, 45,712,161 tons. How many tons of coal were produced that year?

2. The number of tons of iron ore produced in a recent year throughout the world was 143,045,754. Of this amount the United States produced 55,150,147 tons, and Great Britain 15,519,424 tons. How many tons were produced by the rest of the world?

3. Write the following numbers in figures and then add them:

Sixty four thousand four hundred seven, eight million two hundred four thousand three hundred eighty-one, nine hundred and six thousandths, and eight hundred four thousandths.

4. A man bought 15 tons of scrap iron and immediately sold 3875 lb. of it. How many pounds had he left?

5. The product is 24,563 and the multiplier is 319. Find the multiplicand.

6. The multiplicand is 78 and the product is 395.46. Find the multiplier.

7. The quotient is 91.27 and the divisor is 8.36. Find the dividend.

8. The dividend is 6788.76 and the quotient is 132. Find the divisor.

9. If Kate bought 6 War Stamps @ \$4.17, 3 War Stamps @ \$4.18, 2 @ \$4.19, 2 @ \$4.12, and 3 @ \$4.14, what was the average cost per stamp?

10. A milliner on piecework received 17¢ per hat. What was her income for a week of 6 days, if she averaged 19 hats per day?

11. How many boxes, each weighing 125 lb., can be loaded on a car whose capacity is 60,000 lb.?

12. Cast iron weighs 450 lb. per cubic foot. How many cubic feet are there in a casting weighing 32,240 lb.?

13. I paid $76.50 for 18 shirts. What was the average price per shirt?

14. If 7.5 doz. screws were taken out of a box containing a gross, how many screws were left?

15. If 48 nails weigh 1 lb., how many boxes, each containing 24 nails, can be filled from a stock of 60 lb. of nails?

16. Light travels at the rate of 186,000 mi. a second. The sun is 93,000,000 mi. away. How long does it take the light of the sun to reach us?

17. Mr. Allen bought 1756 yd. of cloth at $1.18 a yard and sold all for $3560. What was his profit?

18. Find the cost of 9600 sheets of paper at $2.80 per thousand.

19. A grocer had 147 lb. of flour left in a barrel. How many 3.5-pound bags was he able to fill with this flour?

20. There were 144 pupils in a certain grade in April. During that month they bought $180.50 worth of Thrift and War Stamps. What was the average amount bought per pupil?

21. If the British army required 95,000 tons of hay a month during the World War, what amount of hay was required per day during May? during February? during June?

FACTORS, DIVISORS, AND MULTIPLES

1. Why are 3 and 2 called factors of 6?

2. What is a factor of a number?

3. What is a prime number? Mention five prime numbers.

4. What is a prime factor of a number? Give a prime factor of 8; of 6; of 21; of 4.

5. What is meant by factoring a number?

6. Why is 2 a *common factor* of 8 and 12?

7. Can you give another name for factor?

8. What is a common factor of two or more numbers?

9. Why is 4 the *greatest common factor* of 8 and 12?

10. Give another name for greatest common factor.

11. What is the greatest common divisor (g. c. d.) of 12 and 24? of 8 and 16? of 20 and 40? of 12 and 18?

12. Why is 12 called a *multiple* of 2? of 6? of 4?

13. What is a multiple of a number?

14. Why is 12 a *common multiple* of 4 and 6? of 3 and 4? of 2 and 3?

15. Why is 6 the *least common multiple* of 2 and 6? of 2 and 3? of 6, 2, and 3?

16. What is the least common multiple (l. c. m.) of two or more numbers?

> The **greatest common divisor** of two or more numbers is the product of their common prime factors.

To find the greatest common divisor.

Example 1: Find the g. c. d. of 24, 48, and 56.

Work

$24=2\times2\times2\times3$
$48=2\times2\times2\times3\times2$
$56=2\times2\times2\times7$

g. c. d. $=2\times2\times2=8$, *Ans.*

Separate each of the given numbers into its prime factors. The product of the prime factors that are *common* to all the given numbers is their g. c. d.

Example 2: Find the g. c. d. of 614 and 2149.

Work

614)2149(3
1842
307)614(2
614

The last divisor, 307, is the g. c. d., *Ans.*

To find the g. c. d. of two large numbers divide the larger number by the smaller number and use each remainder as a new divisor with the preceding divisor as dividend, until there is no remainder. The last divisor is the g. c. d.

Give the g. c. d. of: [Without pencil]

	a	*b*	*c*
1.	4 and 6	9 and 18	3, 9, and 15
2.	6, 9, and 12	12 and 21	5, 10, and 25
3.	8 and 12	4, 12, and 16	4, 8, and 20
4.	8, 12, and 16	8, 16, and 32	4, 12, and 18

Find the g. c. d. of: [With pencil]

1.	54 and 72	504 and 560	990 and 1320
2.	36 and 90	72 and 96	315 and 2187
3.	333 and 592	18, 45, and 81	350 and 420
4.	288 and 432	307 and 614	400 and 650
5.	56 and 84	264 and 312	480 and 600
6.	54 and 99	72 and 216	500 and 750
7.	480 and 720	21, 56, and 70	288 and 360

To find the least common multiple.

Example: Find the l. c. m. of 8, 12, and 18.

INSPECTION METHOD

WORK

Since you know that the l. c. m. must be larger than any of the numbers or as large as the largest number given, and must contain each of the given numbers one or more times, select the largest of the given numbers (18 in this case) and see whether it contains each of the numbers one or more times. Note that 18 is not exactly divisible by either 8 or 12. Therefore, it is not the l. c. m. Apply the same test to multiples of 18, beginning with the smallest, (2×18, 3×18, etc.) until you reach one that is divisible by each of the numbers. 4×18 or 72 is exactly divisible by 8 and by 12, therefore 72 is the l. c. m. of 8, 12, and 18.

This method is suitable where the numbers are small.

PRIME FACTOR METHOD

WORK

2	8	12	18
2	4	6	9
3	2	3	9
	2	1	3

$2\times2\times3\times2\times3=72$, l. c. m., *Ans.*

In this method you go through a series of divisions by prime factors that will divide at least two of the numbers. Numbers that cannot be divided should be brought down unchanged. The l. c. m. is the product of the divisors and the final result of such continued factoring.

Find by inspection the l. c. m. of: [Use pencil when needed]

	a	*b*	*c*
1.	4 and 8	3 and 6	4, 6, and 12
2.	9, 6, and 3	6, 9, and 12	2, 4, and 5
3.	4, 6, 9, and 12	5, 6, and 12	16, 8, 12, and 24

Find the l. c. m. and the g. c. d. of:

4.	45 and 54	27 and 63	9, 12, and 15
5.	32, 48, and 12	24, 48, and 96	3, 12, and 15
6.	6, 9, 12, and 18	36 and 84	10 and 45

Cancellation

The process of shortening work in division by dividing both dividend and divisor by factors common to both is called **cancellation.**

Example: Divide $9\times6\times12$ by $3\times15\times4$.

WORK

Indicate the division by writing $9\times6\times12$ above a line and $3\times15\times4$ below it, as a fraction.

$$\frac{\text{Dividend, } 9\times6\times12}{\text{Divisor, } \quad 3\times15\times4}=?$$

Think of this example as made up of factors reading $\frac{(3\times3)\times(3\times2)\times(4\times3)}{(3\times1)\times(3\times5)\times(4\times1)}$. Divide by the factors common to both dividend and divisor, namely, by 3, 3, and 4, and set down the remaining factors as shown in the following:

$$\frac{\overset{3}{\cancel{9}}\times\overset{2}{\cancel{6}}\times\overset{3}{\cancel{12}}}{\underset{1}{\cancel{3}}\times\underset{5}{\cancel{15}}\times\underset{1}{\cancel{4}}}=\frac{18}{5}=3\tfrac{3}{5},\ \textit{Ans.}$$

☞ *Dividing dividend and divisor by the same number does not change the value of the quotient.*

Divide, using cancellation: [With pencil]

	a	*b*
1.	$8\times15\times9$ by $3\times6\times4$	$500\times3\times24$ by 360×15
2.	$25\times15\times6\times4$ by 12×10	$1200\times3\times420$ by 200×360
3.	$81\times14\times24$ by 28×27	$5000\times11\times270$ by 200×33

Find the quotient of:

4.	$\frac{36\times27\times49\times50}{70\times18\times15}$	$\frac{36\times48\times24\times16}{27\times56\times8}$

FRACTIONS

1. What is a fraction?

2. What is the difference between a common fraction and a decimal fraction?

3. Tell which of the following are common fractions and which are decimal fractions:

$$.016,\ \tfrac{3}{5},\ \tfrac{8}{9},\ .5,\ .16,\ \tfrac{5}{8}.$$

4. What are the terms of a fraction?

5. Why is $\frac{3}{5}$ called a *proper fraction?*

6. Why is $\frac{5}{3}$ called an *improper fraction?*

7. Why is $3\frac{3}{5}$ called a *mixed number?*

8. Tell which of the following are proper fractions, which are improper fractions, and which are mixed numbers:

$$\tfrac{5}{5},\ \tfrac{3}{3},\ 2\tfrac{1}{2},\ \tfrac{9}{8},\ 6\tfrac{1}{5}\ \ \tfrac{8}{8},\ \tfrac{3}{4}.$$

9. Read the fraction $\frac{2}{3}$ in two different ways.

10. Why is $\frac{\frac{7}{8}}{\frac{3}{4}}$ called a *complex fraction?*

11. What is a complex fraction?

Reading and Writing Fractions

1. Read each of the following and tell what kind of number it is: $\frac{8}{9}$, $\frac{5}{3}$, 4.16, 24, $8\frac{3}{5}$, $\frac{4}{4}$, $\frac{9}{7}$, $\frac{\frac{2}{3}}{5}$, $\frac{8\frac{1}{2}}{2\frac{1}{3}}$.

☞ *Remember that the decimal point is always read "and."*

Write with figures in common fractional form:

	a	*b*
2.	Seven eighths.	Thirteen thirty-sixths.
3.	Sixteen and nine tenths.	Three and four fifths.
4.	Nineteen divided by eight.	Twelve fourths.

Write with figures in decimal form:

5. Six hundred six thousandths.
6. Six hundred and six thousandths.
7. Twelve hundred and five hundredths.

Reduction of Fractions

Example: Change $\frac{24}{5}$ to a mixed number.

WORK

$\frac{24}{5} = 24 \div 5 = 4\frac{4}{5}$, *Ans.*

$$5\overline{)24}\quad 4\tfrac{4}{5}$$

To reduce an improper fraction to a mixed number, divide the numerator by the denominator.

Change to mixed numbers: [Use pencil when needed]

	a	*b*	*c*
1.	$\frac{36}{15}$	$\frac{175}{16}$	$\frac{379}{25}$
2.	$\frac{45}{8}$	$\frac{225}{35}$	$\frac{497}{24}$
3.	$\frac{224}{3}$	$\frac{129}{18}$	$\frac{816}{32}$

Example: Change $14\frac{2}{3}$ to an improper fraction.

WORK

$$\begin{array}{r} 14 \\ \times\ 3 \\ \hline 42 \\ +2 \\ \hline 44 \end{array}$$

Since 1 unit = 3 thirds,
14 units = 14 times 3 thirds = 42 thirds, and
$14\frac{2}{3}$ = 42 thirds + 2 thirds = 44 thirds or $\frac{44}{3}$.

$14\frac{2}{3} = \frac{44}{3}$, *Ans.*

To reduce a mixed number to an improper fraction, multiply the integer by the denominator of the fraction and add the numerator of the fraction to the product for a new numerator. The denominator remains unchanged.

Change to improper fractions:

	a	*b*	*c*
4.	$26\frac{2}{5}$	$32\frac{3}{4}$	$51\frac{7}{8}$
5.	$18\frac{7}{15}$	$29\frac{5}{7}$	$37\frac{7}{9}$
6.	$28\frac{3}{4}$	$68\frac{5}{16}$	$72\frac{5}{12}$
7.	$15\frac{5}{8}$	$53\frac{7}{10}$	$60\frac{3}{16}$

A fraction is in its **lowest terms** when the numerator and the denominator cannot both be divided by a common factor. Thus, $\frac{1}{3}$, $\frac{1}{8}$, $\frac{7}{12}$, and $\frac{3}{5}$ are in their lowest terms.

You have learned that multiplying or dividing both terms of a fraction by the same number does not change its value.

☞ *Remember:*

To reduce a fraction to *lower* terms, *divide* both numerator and denominator by the same number.

To reduce a fraction to *higher* terms, *multiply* both numerator and denominator by the same number.

To reduce a fraction to *lowest terms*, divide both numerator and denominator by their greatest common divisor.

$$\frac{16}{24} = \frac{2}{3}$$

(8 ÷ 2 = 4; 12 ÷ 4 = 3)

At sight reduce to their lowest terms: [Without pencil]

	a	*b*	*c*
1.	$\frac{18}{36}$	$\frac{12}{24}$	$\frac{15}{25}$
2.	$\frac{24}{36}$	$\frac{48}{56}$	$\frac{96}{108}$
3.	$\frac{16}{18}$	$\frac{21}{24}$	$\frac{12}{32}$

Reduce to their lowest terms: [With pencil]

	a	*b*	*c*
1.	$\frac{35}{45}$	$\frac{28}{54}$	$\frac{36}{54}$
2.	$\frac{72}{320}$	$\frac{77}{231}$	$\frac{16}{128}$
3.	$\frac{85}{153}$	$\frac{130}{162}$	$\frac{256}{480}$

Reduce:

	a	*b*	*c*
4.	$\frac{4}{5}$ to 45ths	$\frac{5}{9}$ to 63ds	$\frac{3}{8}$ to 64ths
5.	$\frac{7}{8}$ to 120ths	$\frac{3}{8}$ to 72ds	$\frac{3}{5}$ to 75ths
6.	$\frac{3}{4}$ to 32ds	$\frac{5}{12}$ to 60ths	$\frac{7}{9}$ to 135ths

Example 1: Change .0375 to a common fraction in its lowest terms.

WORK

$$.0375=\frac{\overset{3}{\cancel{375}}}{\underset{80}{\cancel{10000}}}=\frac{3}{80},\ \textit{Ans.}$$

Example 2: Change 8.125 to a mixed number in its lowest terms.

WORK

$$8.125=8\frac{\overset{1}{\cancel{125}}}{\underset{8}{\cancel{1000}}}=8\frac{1}{8},\ \textit{Ans.}$$

Reduce to common fractions in their lowest terms:

	a	*b*	*c*	*d*	*e*
7.	.08	.05	.50	.625	.75
8.	.0625	.125	.025	.375	.0875

Write as mixed numbers in their lowest terms:

9.	8.375	16.04	8.75	36.4	16.625
10.	15.06	24.6	35.125	3.80	2.50

Express as mixed numbers:

11.	3.25	4.5	2.0625	4.125	3.75
12.	1.075	$2.33\frac{1}{3}$	1.65	$4.06\frac{1}{4}$	3.0375

Example 3: Reduce $\frac{3}{4}$ to a decimal fraction.

WORK

$\frac{3}{4}=3\div4=.75$, *Ans.*

$$4\overline{)3.00}\quad .75$$

Divide the numerator by the denominator, annexing any number of zeros after the decimal point in the dividend.

Reduce to decimal fractions: [With pencil]

	a	*b*	*c*	*d*	*e*
1.	$\frac{4}{5}$	$\frac{7}{8}$	$\frac{9}{20}$	$\frac{17}{40}$	$\frac{11}{25}$
2.	$\frac{5}{6}$	$\frac{11}{15}$	$\frac{7}{32}$	$\frac{17}{30}$	$\frac{15}{36}$

Note that the number after "of" is the denominator of the resulting fraction.

Always reduce the resulting fraction to its lowest terms.

Find what fractional part:

	a	*b*	*c*
3.	6 is of 15	32 is of 18	9 is of 36
4.	9 is of 24	24 is of 16	36 is of 9
5.	16 is of 18	25 is of 15	5 is of 25
6.	18 is of 24	16 is of 64	25 is of 5
7.	12 is of 27	32 is of 36	48 is of 30

What fractional and decimal part of:

	a	*b*	*c*
8.	24 is 16?	36 is 24?	16 is 12?
9.	35 is 14?	48 is 16?	80 is 45?
10.	36 is 28?	35 is 25?	54 is 18?
11.	38 is 19?	42 is 14?	45 is 15?

Express as a common fraction and as a decimal fraction, the fractional part:

12.	8 is of 12	24 is of 60	48 is of 60
13.	15 is of 24	24 is of 64	60 is of 72
14.	10 is of 12	35 is of 45	75 is of 85
15.	35 is of 21	15 is of 40	36 is of 60
16.	18 is of 32	45 is of 18	40 is of 50

Express as a common fraction and as a decimal fraction:

	a	*b*
17.	$\frac{3}{5}$ is what part of $\frac{4}{5}$?	$\frac{1}{3}$ is what part of $\frac{5}{9}$?
18.	$\frac{3}{8}$ is what part of $\frac{5}{8}$?	$\frac{3}{8}$ is what part of $\frac{3}{4}$?
19.	$\frac{1}{4}$ is what part of $\frac{1}{2}$?	$\frac{5}{6}$ is what part of $1\frac{1}{2}$?
20.	$\frac{3}{5}$ is what part of $\frac{9}{5}$?	$\frac{3}{4}$ is what part of $2\frac{1}{2}$?

Addition and Subtraction of Fractions

☞ *Remember:*

To *add* fractions, reduce them to fractions having the least common denominator and then add the numerators for the numerator of the sum. Reduce the sum to its lowest terms.

To *subtract* fractions, reduce them to fractions having the least common denominator and then subtract the numerators for the numerator of the difference. Reduce the difference to its lowest terms.

Example 1: Add $1\frac{3}{4}$, $2\frac{5}{8}$, and $2\frac{7}{12}$.

WORK

l. c. d. = 24

$1\frac{3}{4} = 1\frac{18}{24}$
$2\frac{5}{8} = 2\frac{15}{24}$
$2\frac{7}{12} = 2\frac{14}{24}$
$5\frac{47}{24} = 5 + 1\frac{23}{24} = 6\frac{23}{24}$, *Ans.*

Or,

	24
$1\frac{3}{4}$	18
$2\frac{5}{8}$	15
$2\frac{7}{12}$	14
5	$\frac{47}{24} = 6\frac{23}{24}$, *Ans.*

Example 2: Subtract $3\frac{3}{4}$ from $8\frac{1}{8}$.

WORK

l. c. d. = 8

$8\frac{1}{8} = 7\frac{9}{8}$
$3\frac{3}{4} = 3\frac{6}{8}$
$4\frac{3}{8}$, *Ans.*

Or,

	8
$8\frac{1}{8}$	1
$3\frac{3}{4}$	6
4	$\frac{3}{8}$, *Ans.*

Since $\frac{6}{8}$ cannot be subtracted from $\frac{1}{8}$, add a unit or $\frac{8}{8}$ to $\frac{1}{8}$, making the minuend $\frac{9}{8}$, and say $\frac{6}{8}+\frac{3}{8}=\frac{9}{8}$. Write $\frac{3}{8}$. Since you added 1 unit to the minuend you must add 1 unit to the subtrahend $3\frac{3}{4}$, and say $4+4=8$. Write 4. The difference is $4\frac{3}{8}$.

☞ *To prevent mistakes:*

1. Write figures carefully.
2. Do not crowd your figures.
3. Do not add numerators and denominators. Separate them so that you can tell *at once* which are the numerators.
4. Check every calculation.

First find the sums, then find the differences: [Without pencil]

	a	*b*	*c*
1.	$\frac{1}{2}$ and $\frac{1}{4}$	$\frac{4}{5}$ and $\frac{3}{10}$	$\frac{7}{8}$ and $\frac{3}{4}$
2.	$\frac{3}{8}$ and $\frac{1}{4}$	$\frac{5}{6}$ and $\frac{5}{9}$	$\frac{5}{6}$ and $\frac{7}{12}$
3.	$\frac{5}{8}$ and $\frac{1}{2}$	$\frac{3}{4}$ and $\frac{2}{3}$	$\frac{3}{8}$ and $\frac{3}{16}$
4.	$\frac{7}{9}$ and $\frac{2}{3}$	$\frac{5}{6}$ and $\frac{1}{2}$	$\frac{9}{10}$ and $\frac{3}{5}$
5.	$\frac{5}{6}$ and $\frac{1}{3}$	$\frac{5}{6}$ and $\frac{3}{8}$	$\frac{2}{3}$ and $\frac{5}{12}$

State the answers quickly:

6.	$\frac{3}{5}-\frac{1}{2}$	$\frac{7}{8}+\frac{1}{4}$	$\frac{3}{4}-\frac{5}{8}$
7.	$\frac{4}{5}-\frac{7}{10}$	$\frac{5}{12}+\frac{1}{2}$	$\frac{3}{4}+\frac{5}{16}$
8.	$\frac{2}{5}+\frac{5}{6}$	$\frac{5}{6}+\frac{1}{8}$	$\frac{15}{16}-\frac{3}{8}$

1. Add upward and crosswise: [With pencil]

	a		*b*		*c*		*d*
e.	$2\frac{3}{4}$	+	$5\frac{1}{2}$	+	$7\frac{5}{8}$	+	$3\frac{5}{8}$
f.	$2\frac{1}{3}$	+	$6\frac{3}{5}$	+	$8\frac{7}{10}$	+	$2\frac{3}{4}$
g.	$\frac{5}{12}$	+	$2\frac{3}{8}$	+	$\frac{5}{16}$	+	$3\frac{7}{8}$
h.	$3\frac{2}{5}$	+	$6\frac{1}{3}$	+	$5\frac{1}{2}$	+	$7\frac{5}{9}$
i.	$6\frac{5}{6}$	+	$1\frac{1}{10}$	+	$1\frac{3}{4}$	+	$2\frac{1}{3}$

Subtract:

	a	*b*	*c*
2.	$7\frac{5}{8}$ from 16	$2\frac{3}{5}$ from 13	$11\frac{7}{9}$ from $15\frac{1}{3}$
3.	$16\frac{5}{6}$ from $24\frac{1}{4}$	$3\frac{15}{16}$ from $7\frac{3}{4}$	$2\frac{7}{12}$ from $3\frac{1}{9}$
4.	$7\frac{7}{8}$ from 25	$3\frac{5}{8}$ from $15\frac{3}{4}$	$16\frac{2}{3}$ from $33\frac{1}{3}$

☞ *Remember:*

To add or subtract common and decimal fractions reduce them all to common fractions or to decimal fractions; then add or subtract as required. Thus,

$$\frac{5}{12}+.375+\frac{3}{4}=\frac{5}{12}+\frac{3}{8}+\frac{3}{4}=\frac{10+9+18}{24}=\frac{37}{24}=1\tfrac{13}{24}$$

Add:

5. $\frac{5}{6}$, $12\frac{1}{2}$, .875, .2, and 2.125.

6. $3\frac{1}{20}$, .5, $16\frac{3}{4}$, .25, 6.2, and 8.75.

7. 12.625, $\frac{3}{8}$, $\frac{5}{6}$, 2.5, $\frac{3}{40}$, and $\frac{2}{3}$.

8. 2.8, $3\frac{1}{5}$, $\frac{5}{7}$, 4.25, and $6\frac{1}{8}$.

9. $3\frac{1}{8}$, .6, .125, .4, 5.9, and $3\frac{3}{5}$.

10. From the sum of $8\frac{1}{4}$, $15\frac{5}{6}$, and $3\frac{5}{8}$ take $7\frac{5}{12}$.

11. To the difference between $62\frac{7}{12}$ and $16\frac{5}{9}$ add $3\frac{1}{3}$ and 5.5.

12. From the sum of $3\frac{1}{4}$, $4\frac{5}{8}$, and $3\frac{1}{8}$ subtract the sum of $4\frac{1}{6}$ and $3\frac{5}{6}$.

13. $3\frac{1}{4}+2\frac{1}{6}-1\frac{5}{8}+2\frac{2}{3}=?$

14. $12\frac{5}{6}-3\frac{5}{8}+1\frac{1}{3}+\frac{5}{9}=?$

Find the missing numbers:

	Cost	Gain	Loss	Selling Price
15.	$\$12\frac{3}{4}$	—	$\$ 5\frac{5}{8}$	?
16.	$\$18\frac{1}{2}$	$\$6\frac{13}{20}$	—	?
17.	?	—	$\$18\frac{1}{2}$	$\$58\frac{7}{8}$
18.	?	$\$12\frac{5}{8}$	—	$\$82\frac{3}{5}$
19.	$\$23\frac{1}{8}$	—	$\$7\frac{3}{10}$	?
20.	$\$30\frac{1}{2}$	$\$ 5\frac{1}{2}$	—	?
21.	?	—	$\$15\frac{3}{4}$	$\$60\frac{1}{2}$
22.	$\$54\frac{4}{5}$	$\$ 3\frac{1}{2}$	—	?

Multiplication of Fractions

☞ *Remember:*

I. To multiply common fractions, multiply the numerators together for the new numerator and multiply the denominators together for the new denominator, after canceling wherever possible.

Example 1: Multiply $\frac{8}{9}$ by $\frac{15}{18}$.

Work

$$\frac{\overset{4}{\cancel{8}}}{\underset{3}{\cancel{9}}} \times \frac{\overset{5}{\cancel{15}}}{\underset{9}{\cancel{18}}} = \frac{4 \times 5}{3 \times 9} = \frac{20}{27}, \textit{ Ans.}$$

II. To multiply a mixed number by an integer, multiply the fraction by the integer and also the whole number by the integer, and then add the products; or change the mixed number to an improper fraction and multiply.

Example 2: Multiply $48\frac{2}{3}$ by 5.

Work

$$\begin{array}{r} 48\frac{2}{3} \\ 5 \\ \hline 3\frac{1}{3} \quad (5 \times \frac{2}{3}) \\ 240 \quad (5 \times 48) \\ \hline 243\frac{1}{3}, \textit{ Ans.} \end{array}$$

Or, $5 \times \frac{146}{3} = \frac{730}{3} = 243\frac{1}{3}$, *Ans.*

III. To multiply a mixed number by a fraction, or to multiply one mixed number by another, change the mixed numbers to improper fractions, and proceed as in multiplication of fractions.

Example 3: Multiply $8\frac{3}{4}$ by $4\frac{4}{5}$.

Work

$$8\tfrac{3}{4} = \tfrac{35}{4}$$
$$4\tfrac{4}{5} = \tfrac{24}{5}$$

$$\frac{\overset{6}{\cancel{24}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{7}{\cancel{35}}}{\underset{1}{\cancel{4}}} = \frac{7 \times 6}{1} = 42, \textit{ Ans.}$$

IV. In multiplying one decimal by another, point off in the product, beginning at the right, as many decimal places as there are decimal places in both the multiplicand and the multiplier.

Example 4: Multiply 2.8 by .07.

WORK

2.8
.07
.196, *Ans.*

Remember that the word "of" between fractions is a sign of multiplication.

Give the value of: [Without pencil]

	a	*b*	*c*
1.	$\frac{5}{6}$ of 24	$\frac{3}{4}$ of 20	$\frac{2}{3}$ of 15
2.	$\frac{5}{9}$ of 36	$16\times\frac{7}{8}$	$64\times\frac{5}{8}$
3.	$\frac{9}{10}$ of 80	$\frac{7}{12}$ of 36	$\frac{7}{8}$ of 32

4. Multiply each of the following by 4, by 8, by 9, by 12, and by 6:

$\frac{3}{4}$	$\frac{2}{3}$	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{5}{8}$

Give the value of:

	a	*b*	*c*
5.	$\frac{2}{3}\times\frac{5}{7}$	$\frac{3}{4}$ of $\frac{8}{9}$	$\frac{4}{5}\times\frac{3}{8}$
6.	$\frac{1}{2}$ of $\frac{4}{5}$	$\frac{2}{3}$ of $\frac{9}{10}$	$\frac{3}{4}\times\frac{5}{8}$
7.	$\frac{2}{3}$ of $\frac{5}{6}$	$3\frac{3}{4}\times12$	$2\frac{1}{2}\times8$

Find the value of: [With pencil]

	a	*b*
1.	$3\frac{3}{4}\times12\times1\frac{3}{5}$	$6\frac{1}{4}\times1\frac{1}{5}\times8\frac{3}{8}\times12$
2.	$\frac{8}{15}\times3\frac{3}{4}\times\frac{2}{9}\times2\frac{2}{3}$	$4\frac{3}{8}\times1\frac{3}{5}\times24\times2\frac{2}{3}$
3.	$3\frac{1}{3}\times\frac{5}{100}\times\$450$	$\frac{108}{360}\times\frac{9}{200}\times\$1500$
4.	$2\frac{1}{4}\times\frac{3}{100}\times\$780$	$\frac{240}{360}\times\frac{17}{400}\times\$1650$
5.	$\frac{96}{360}\times\frac{4}{100}\times\$350$	$\frac{165}{360}\times\frac{5}{100}\times\$560.75$

Division of Fractions

The **reciprocal** of a number is the number *inverted*. Thus, the reciprocal of 2 is $\frac{1}{2}$, and the reciprocal of $\frac{1}{2}$ is 2; the reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$ and of $\frac{4}{3}$, $\frac{3}{4}$, etc.

☞ *Remember:*

1. To divide by a number, multiply by its *reciprocal.*
2. To divide an integer or a fraction or a mixed number by a fraction, invert the *divisor* and proceed as in multiplication of fractions. (If the divisor is a mixed number, change it to an improper fraction and then invert.)

Example 1: Divide $2\frac{2}{3}$ by $\frac{4}{5}$.

WORK

$$2\tfrac{2}{3} \div \tfrac{4}{5} = \tfrac{8}{3} \div \tfrac{4}{5} = \tfrac{8}{3} \times \tfrac{5}{4}$$

$$\frac{\overset{2}{\cancel{8}}}{3} \times \frac{5}{\underset{1}{\cancel{4}}} = \frac{10}{3} = 3\tfrac{1}{3},\ \textit{Ans.}$$

Example 2: Divide $\frac{8}{9}$ by 4.

WORK

$$\frac{8}{9} \div 4 = \frac{\overset{2}{\cancel{8}}}{9} \times \frac{1}{\underset{1}{\cancel{4}}} = \frac{2}{9},\ \textit{Ans.}$$

Example 3: Divide 125 by $3\frac{3}{4}$.

WORK

$$125 \div 3\tfrac{3}{4} = 125 \div \frac{15}{4} = \frac{\overset{25}{\cancel{125}}}{1} \times \frac{4}{\underset{3}{\cancel{15}}}$$

$$= \tfrac{100}{3} = 33\tfrac{1}{3},\ \textit{Ans.}$$

Give the value of: [Without pencil]

	a	*b*	*c*
1.	$18 \div \frac{2}{3}$	$20 \div \frac{4}{5}$	$\frac{5}{6} \div 15$
2.	$16 \div \frac{4}{5}$	$40 \div \frac{5}{9}$	$\frac{7}{9} \div 14$

Give the value of:

	a	*b*	*c*
3.	$12 \div \frac{1}{4}$	$\frac{8}{9} \div 4$	$\frac{3}{5} \div 6$
4.	$\frac{3}{4} \div \frac{3}{8}$	$\frac{3}{5} \div \frac{9}{10}$	$2\frac{1}{3} \div 7$
5.	$\frac{5}{6} \div \frac{5}{9}$	$\frac{2}{3} \div \frac{3}{4}$	$3\frac{3}{4} \div 5$
6.	$\frac{4}{9} \div \frac{2}{3}$	$7\frac{1}{5} \div 12$	$4\frac{4}{5} \div 6$

7. Divide each of the following by 8, by 4, by 9, by 12, by 6:

$\frac{2}{3}$	$2\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{6}$	$1\frac{1}{4}$

Find the value of: [With pencil]

	a	*b*	*c*
1.	$8\frac{2}{5} \div \frac{2}{5}$	$9\frac{1}{3} \div \frac{7}{8}$	$8\frac{2}{5} \div 1\frac{3}{4}$
2.	$\frac{8}{9} \div 2\frac{2}{3}$	$4\frac{2}{3} \div 7\frac{5}{6}$	$15\frac{1}{4} \div \frac{3}{4}$
3.	$3\frac{1}{9} \div 1\frac{1}{3}$	$330 \div 8\frac{4}{5}$	$135 \div 1\frac{2}{3}$

Find the quotients:

	a	*b*
4.	$133 \div 3\frac{1}{2}$	$(1\frac{2}{3} \div \frac{5}{8}) \times (\frac{1}{2} \div 6)$
5.	$\frac{7}{24} \div 2\frac{1}{10}$	$(\frac{5}{6} \div 2\frac{2}{3}) \times (16 \div \frac{5}{8})$
6.	$180 \div \frac{1}{6}$	$(9 \div \frac{5}{8}) \times (\frac{4}{5} \div 6)$
7.	$(\frac{8}{9}$ of $\frac{3}{4}) \div \frac{5}{6}$	$(\frac{2}{3} \times 2\frac{5}{6} \times \frac{3}{7}) \div 4\frac{1}{2}$
8.	$(\frac{2}{3}$ of $\frac{4}{5}) \div (\frac{5}{8}$ of $\frac{4}{15})$	$(6 \times \frac{3}{8}) \div (\frac{5}{6} \div 8\frac{1}{3}) \div 5$

Find the value of:

	a	*b*	*c*
9.	$\frac{\frac{9}{16}}{\frac{3}{8}}$	$\frac{4\frac{2}{3}}{\frac{2}{5}}$	$\frac{6\frac{3}{5}}{\frac{3}{10}}$
10.	$\frac{\frac{2}{3} \times \frac{6}{7}}{8}$	$\frac{2\frac{3}{4} \times \frac{4}{5}}{\frac{11}{15}}$	$\frac{\frac{8}{15}}{4\frac{2}{3} \times 1\frac{2}{7}}$

Simplify:

	a	*b*	*c*
11.	$\frac{\frac{3}{4}+\frac{3}{8}}{3\frac{3}{8}}$	$\frac{6\frac{2}{3}}{2\frac{1}{2}+1\frac{1}{6}}$	$\frac{1\frac{5}{12}-\frac{7}{8}}{\frac{1}{4}+\frac{2}{3}}$
12.	$\frac{\frac{3}{5}\times\frac{5}{6}}{\frac{3}{5}\div\frac{3}{4}}$	$\frac{\frac{1}{6}\text{ of }\frac{7}{9}}{\frac{4}{5}\times\frac{7}{9}}$	$\frac{\frac{5}{8}\text{ of }6}{\frac{3}{4}\div 5}$
13.	$\frac{2\frac{1}{6}-1\frac{5}{8}}{3\frac{1}{4}}$	$\frac{2\frac{1}{2}+1\frac{1}{3}}{4\frac{1}{3}-\frac{1}{4}}$	$\frac{7\frac{1}{2}}{\frac{1}{3}\text{ of }\frac{3}{4}}$

Review of Fractions

[With pencil]

Add, subtract, and multiply with each set of fractions. Also divide the first fraction in each set by the second.

	a	*b*	*c*
1.	$\frac{7}{8}$, $\frac{3}{4}$	$\frac{7}{9}$, $\frac{2}{3}$	$\frac{3}{4}$, $\frac{5}{16}$
2.	$\frac{5}{6}$, .8	$\frac{3}{7}$, $\frac{3}{8}$	2.25, $\frac{3}{8}$

Perform the operations indicated:

3.	$\frac{2}{3}+\frac{1}{6}$	$\frac{2}{3}-\frac{1}{6}$	$\frac{2}{3}\div\frac{1}{6}$
4.	$4\frac{1}{2}+1\frac{3}{8}$	$4\frac{1}{2}-1\frac{3}{8}$	$4\frac{1}{2}\times 1\frac{3}{8}$

5. To the difference between $5\frac{7}{9}$ and $3\frac{11}{12}$ add $6\frac{1}{4}+2\frac{5}{6}$.

6. Multiply the sum of $3\frac{5}{6}$ and $1\frac{2}{3}$ by the difference between 8 and $5\frac{3}{8}$.

7. Divide the difference between $3\frac{3}{4}$ and $1\frac{1}{6}$ by $1\frac{2}{3}$.

8. The product is $5\frac{5}{8}$ and the multiplier is $1\frac{1}{15}$. Find the multiplicand.

9. The quotient is $3\frac{3}{4}$ and the dividend is $8\frac{3}{4}$. Find the divisor.

10. The quotient is $4\frac{2}{3}$ and the divisor is $\frac{6}{7}$. What is the dividend?

11. $(4.25 \times 1.25) \div \frac{5}{6} = ?$

12. $(.045 \times 8\frac{1}{3}) \div \frac{1}{2} = ?$

13. $\dfrac{\frac{5}{6}}{\frac{1}{2} \text{ of } \frac{2}{3}} \div \dfrac{\frac{3}{4} \text{ of } \frac{3}{5}}{4\frac{1}{5}} = ?$

14. $94.50 \div \frac{5}{21} = ?$

15. $(.76 \times 2\frac{1}{4}) \div 57 = ?$

16. $(5\frac{1}{2} \times 3\frac{1}{4}) \div 15 = ?$

PROBLEMS [With pencil]

☞ *Read the problem carefully. Note what is required. Check every calculation.*

1. Mother bought $9\frac{1}{2}$ yd. of cloth at a sale. She used $1\frac{3}{4}$ yd. for a jacket and $3\frac{7}{8}$ yd. for a coat. How many yards were left?

2. How many $\frac{1}{8}$-pound boxes can be filled with $12\frac{3}{4}$ lb. of candy?

3. By selling goods for $\$23\frac{1}{4}$ a man lost $\$14\frac{7}{8}$. Find the cost of the goods.

4. At $\$.16\frac{2}{3}$ a pound how many pounds of copper wire can be bought for \$12?

5. A strip of molding is $13\frac{1}{4}$ ft. long. How much must be cut from it to make it $9\frac{5}{8}$ ft. long?



6. If a gallon of gasoline is required for every $11\frac{1}{4}$ mi., how many gallons shall a man carry in his car for a trip of 135 mi.?

7. It required $1\frac{3}{4}$ hr. to reach a certain place by automobile. By train and car it required 35 min. longer. How many hours did it take by train and car?

8. The average speed of a certain automobile on a certain trip was $22\frac{1}{2}$ mi. an hour. What distance, at this rate, was covered in 15 min.? in 20 min.? in 25 min.? in 12 min.?

9. A wholesaler bought coffee at $15\frac{1}{2}¢$ a pound and sold it at $16\frac{3}{8}¢$ a pound. How much was gained on 6 bags of coffee, averaging 132 lb. per bag?

10. A board was cut into 3 pieces, one $5\frac{3}{8}$ in. long, the second $7\frac{5}{16}$ in. long, and the third $6\frac{1}{4}$ in. long. If $\frac{1}{16}$ in. was wasted in cutting, what was the length of the board?

11. Reduce to lowest terms and add: $\frac{8}{12}$, $\frac{18}{27}$, $\frac{12}{15}$, $\frac{10}{25}$, and $\frac{21}{28}$.

12. I paid $36¢$ a yard for $8\frac{3}{4}$ yd. of ribbon and $\frac{4}{5}$ as much for cloth. How much did I spend for cloth?

13. A piece of ribbon contained $10\frac{1}{2}$ yd. How many pieces were needed for 40 sashes, each $2\frac{1}{4}$ yd. long?

14. How much was left from a strip of cloth 16 yd. long after cutting off 3 pieces, each $4\frac{3}{8}$ yd. long?

15. The product of three numbers is $12\frac{3}{5}$. Two of the numbers are $2\frac{1}{2}$ and $1\frac{1}{10}$. What is the third number?

16. A dealer sold $18\frac{7}{8}$ yd. velvet at \$1.60 a yard and gained $\frac{2}{5}$ of the amount received. What was his profit?

17. If I pay $21¢$ for $\frac{7}{8}$ yd. of ribbon, how many yards can I buy for \$2.24 at that rate?

18. *a.* If it takes $3\frac{3}{8}$ yd. of cloth to make a suit, how many yards of cloth are required for 15 suits?

b. How many suits can be made with $37\frac{1}{8}$ yd. of cloth?

19. If \$.56 was paid for $\frac{4}{5}$ yd. of lace, how much must be paid for $5\frac{1}{4}$ yd.?

20. A load of sand weighs 1800 lb. Express the weight as the decimal part of a ton.

21. Which is cheaper, and how much cheaper, to employ a boy at $16\frac{2}{3}¢$ an hour to work for $9\frac{1}{2}$ hr. on a job, or to employ a man at $25¢$ an hour to do the job in 5 hr. 15 min.?

22. An iron bar weighs $2\frac{1}{2}$ lb. to a foot. How long a piece must be taken to weigh $8\frac{3}{4}$ lb.?

23. A certain article can be made with wide or narrow cloth. It requires $6\frac{3}{4}$ yd. of wide material at 24¢ a yard and $9\frac{7}{8}$ yd. of narrow material at 16¢ a yard. Which material would be cheaper, and how much cheaper?

24. If $6\frac{1}{4}$ doz. pencils were taken out of a box containing a gross, what part of the gross remained?

25. If $1\frac{1}{2}$ in. were wasted in cutting a strip of molding $12\frac{1}{4}$ in. long into several parts, what part of the strip was wasted?

26. A dealer sold an article for $\$4\frac{1}{4}$ and lost $\$1\frac{1}{2}$. What part of the cost did he lose?

27. One road is 87.6 mi. long and another is 1.85 as long. How long is the second road?

28. If an automobile travels at the rate of 24.6 mi. an hour, how many miles does it travel in 3 hr. 10 min.?

29. Express as common fractions, and add: .8, .025, and .5.

30. A grocer's clerk sold \$19.95 worth of eggs on Monday at \$.57 a dozen. How many eggs did he sell that day?

31. A steel bar $\frac{9}{16}$ in. long weighs 1.08 lb. Find the weight of a $2\frac{1}{2}$-foot bar of the same steel.

32. A train left a city at 7.33 A.M. and arrived at a town 54.51 mi. distant at 10.11 A.M. What was the average rate of speed per hour?

33. A man earns \$3500 a year and saves \$450. What part of his salary does he save?

34. The multiplier is .045 and the product is 1.665. Find the multiplicand.

35. How much picture molding will be needed for a room $15\frac{3}{4}$ ft. wide and $18\frac{1}{2}$ ft. long?

EQUATIONS

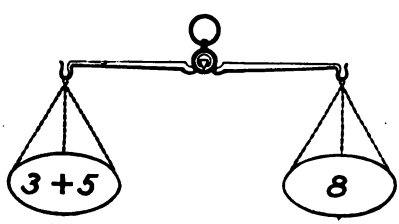
A statement that two numbers or quantities are equal is called an **equation**. Thus:

(*a*) $3+5=8$ (*c*) $3\times4=12$

(*b*) 12 in. = 1 ft. (*d*) 6% of \$100 = \$6

The parts on either side of the sign of equality are called **members**. The part written before the sign of equality is called the *first member*, and that written after the sign is called the *second member*. Thus, in equation (*a*), $3+5$ is the first member, and 8 is the second member. In (*b*), 12 in. is the first member, and 1 ft. is the second member.

When a member is separated into parts by either of the signs + or −, the parts are called **terms**. Thus, in equation (*a*), 3 and 5 are terms of the member $3+5$.



An equation may be considered as a balance scale. The members are equal, that is, the quantities on the two sides are equal; they balance each other.

Many problems may be written in the form of equations.

Example 1: What number added to 6 equals 9?

This may be written $6+?=9$

or $6+n=9$

Here ? or n is the unknown quantity.

Example 2: What number multiplied by 8 equals 24?

This may be written $8n=24$

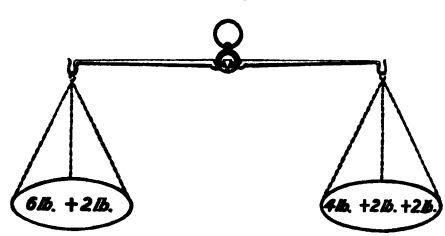
NOTE. Sometimes the unknown number is represented by n or x and sometimes by the first letter of the thing required; as, C for cost, P for percentage, etc.

Write the following in the form of equations:

1. What number multiplied by 9 equals 27?
2. If 6 times a number is 30, what is the number?
3. If I add 8 to a certain number my answer is 15. What is the number?
4. After subtracting 12 from a certain number I have 36 left. What is the number?
5. If $\frac{1}{3}$ the amount of my money is equal to \$100, how much money have I?
6. If 36 pupils or .75 of the class belong to the Junior Red Cross, how many pupils are there in the class?
7. Twice my money plus \$10 equals \$1000. How much money have I?

Finding the value of the unknown number (usually represented by n or x) is called **solving the equation**.

Since an equation is like a balance scale, any change in either member will disturb the balance, unless a similar change is made in the other member.



Thus, if we add 2 to the first member of the equation $6=4+2$, we must add 2 to the second member, in order to maintain the equality.

$$6+2=4+2+2$$

On a balance scale this principle may be shown as indicated in the picture.

Imagine a 6-pound weight on one scale and a 4-pound package of coffee and a 2-pound package of coffee on the other scale. If another 2-pound package of coffee is placed on the scale, the scales will not balance, unless a 2-pound weight is added to the 6-pound weight on the other scale.

Principles: 1. *Adding the same number to or subtracting the same number from both members of an equation does not change the value of the equation.*

2. *Multiplying or dividing both members of an equation by the same number does not change the value of the equation.*

Solution of Equations

In solving equations, always try to move all the known quantities to one member and the unknown quantity to the other member.

Thus, in $n+6=15$, try to have n (the unknown quantity) in one member and the 6 and 15 (the known quantities) in the other member.

After subtracting 6 from the first member, you have n left. To keep the value of the equation the same you must subtract 6 from the second member also.

$$n+6-6=15-6$$
$$n=9$$

Another way of placing the unknown quantity on one side and the known quantities on the other side is to *transpose* quantities from one member to another, by *changing their sign.*

Thus, $n+6=15$

Transposing, you get $n=15-6$

$n=9$

Example 1: Solve the equation $6n=18$.

Work

Dividing both members by 6, you get $n=\frac{18}{6}=3$, *Ans.*

Example 2: Solve $n-3=12$.

Work

Transposing, you get $n=12+3=15$, *Ans.*

Or, adding 3 to each member, you get

$$n-3+3=12+3$$
$$15=n$$
$$n=15, \textit{ Ans.}$$

Solve the following equations:

	a	*b*	*c*
1.	$n+4=20$	$32=n-6$	$3n=25$
2.	$n-7=21$	$8n=32$	$4n=18$
3.	$18=n+6$	$\frac{1}{5}n=5$	$5n=26$

Find the value of n:

4.	$3\frac{1}{5}n=160$	$5\frac{1}{3}n=848$	$\frac{2}{3}n=144$
5.	$3\frac{1}{4}n=130$	$2\frac{1}{5}n=238$	$3\frac{1}{2}n=4\frac{2}{3}$
6.	$6n-24=18$	$\frac{3}{4}n+6=24$	$4\frac{4}{5}n=16$

Solve these equations:

7.	$.08n=3.2$	$\frac{5}{6}n=\frac{2}{3}$	$1\frac{7}{8}n=40$
8.	$.0625n=.25$	$2\frac{1}{2}n=.5$	$.9n=.36$
9.	$.07\frac{1}{2}n=1.5$	$12n-15=45$	$8+4n=40$

Find the value of the unknown quantity:

	a	*b*
10.	$.08n=.8\times2.42$	$2.3x=316.02$
11.	$\frac{6}{7}c=900.6$	$\frac{1}{3}x+15=45$
12.	$2.7n=3.4+.11$	$3\frac{1}{2}c-20=22$
13.	$4\frac{1}{2}n+30=75$	$5\frac{3}{4}x+30=76$
14.	$3.5x=.85-.15$	$2.5x-25=100$

PROBLEMS [With pencil]

Example 1: One fourth of a number and 12 more equal 17. Find the number.

WORK

Let $n=$ the number
Then $\frac{1}{4}n+12=17$
Transposing 12, you get $\frac{1}{4}n=17-12=5$
$n=\frac{4}{1}\times5=20$, *Ans.*

Example 2: $\frac{5}{8}$ of the class were rated B in proficiency and the rest were rated A. If 15 pupils were rated A, how many pupils were there in the class?

WORK

Let n = the number of pupils on register
Then $\frac{5}{8}n$ = the number of pupils rated B
$\frac{3}{8}n$ = the number of pupils rated A
15 pupils = the number of pupils rated A
Therefore $\frac{3}{8}n = 15$

$$n = 15 \div \frac{3}{8} = \overset{5}{\cancel{15}} \times \frac{8}{\cancel{3}_{1}} = 40 \text{ pupils, } \textit{Ans.}$$

1. What number decreased by 24 equals 70?
2. What number increased by 18 equals 32?
3. Eight times a certain number is 24. Find the number.
4. What number multiplied by 7 equals 84?
5. If $\frac{5}{8}$ of a number is 25, what is the number?
6. What number divided by 15 equals 60?
7. A man gained \$25, or $\frac{5}{8}$ of the cost, by selling certain goods. Find the cost.
8. A man collected \$63 interest, which was $\frac{3}{40}$ of the sum invested. How much money was invested?
9. After drawing $\frac{2}{5}$ of his money from the school bank, George had \$21.60 left. How much had he at first?
10. A father left his son \$5000, which amount was $2\frac{1}{2}$ times as much as he left his daughter. How much did his daughter receive?
11. A boy spent $\frac{3}{8}$ of his money for a tennis outfit and had \$25 left. How much had he at first?
12. Mr. Andrews sold his car for \$850, which was $\frac{5}{6}$ of the amount that he paid for it. Find the loss.
13. If $4\frac{1}{2}$ yd. of velvet cost \$10.80, find the cost of 1 yd.

DENOMINATE NUMBERS



The name given to a unit of measure or of weight is its **denomination.**

A number having one or more denominations is called a **denominate number.**

A denominate number composed of units of one denomination only is a **simple denominate number**; as, 5 yards, 5 dollars, 3 pints.

A denominate number composed of units of two or more related denominations is a **compound denominate number**; as, 3 hr. 20 min. 5 sec., 4 gal. 2 qt. 1 pt.

The process of changing a number from one denomination to another without changing its value is called **reduction.**

NOTE. The word *reduction* sometimes has a different meaning. Thus, reduction in weight, wages, rank, etc., means a loss of or a lowering in value.

Reduction of Denominate Numbers

(See List of Tables in Appendix.)

☞ *Remember:*

To reduce to lower denominations, *multiply;* to reduce to higher denominations, *divide.*

1. Lower Denominations: 10 yd. 2 ft. 10 in. = 394 in.
2. Higher Denominations: 394 in. = 10 yd. 2 ft. 10 in.

To reduce to lower denominations.

Example: Reduce 4 gal. 3 qt. 1 pt. to pints.

Work (Table) 4		2	
4 gal.	3 qt.	1 pt.	1 gal. = 4 qt.
4	16	38	4 gal. = 4×4 qt. = 16 qt.
16	19	39 pt., *Ans.*	16 qt. + 3 qt. = 19 qt.
	2		1 qt. = 2 pt.
	38		19 qt. = 19×2 pt. = 38 pt.
			38 pt. + 1 pt. = 39 pt., *Ans.*

(To save time, multiply 19 by 2 instead of 2 by 19, etc.)

☞ *Be sure that you know your tables.*

[Use pencil when needed]

Change to the next lower denominations:

	a	*b*	*c*	*d*
1.	6 ft.	4 yd.	2 gal.	3 qt.
2.	4 doz.	2 T.	4 lb.	7 wk.
3.	2 pk.	9 sq. yd.	3 bu.	3 cu. yd.

Change to lowest denominations given:

	a	*b*	*c*
4.	2 yd. 1 ft.	2 bu. 1 pk.	2 gal. 1 qt.
5.	5 cu. yd. 1 cu. ft.	4 yr. 8 mo. 20 da.	16 yd. 1 in.
6.	2 T. 4 cwt.	4 ft. 9 in.	1 yr. 4 mo. 10 da.
7.	5 yd. 10 in.	8 cwt. 12 lb. 12 oz.	8 bu. 3 qt.
8.	9 min. 12 sec.	2 A. 10 sq. rd.	6 rd. 4 yd. 1 ft.

To reduce to higher denominations.

Example: Reduce 460 in. to higher denominations.

WORK

12)460 in.
3) 38 ft. + 4 in.
12 yd. + 2 ft.
12 yd. 2 ft. 4 in., *Ans.*

Since there are 12 in. in 1 ft., in 460 in. there are as many feet as 12 in. are contained times in 460 in., or 38 ft. and 4 in. remainder.

Since there are 3 ft. in 1 yd., in 38 ft. there are as many yards as 3 ft. are contained times in 38 ft., or 12 yd. and 2 ft. remainder. Therefore in 460 in. there are 12 yd. 2 ft. 4 in.

[Use pencil when needed]

Change to the next higher denominations:

	a	*b*	*c*	*d*
1.	19 sq. ft.	156 sq. in.	42 cu. ft.	16 in.
2.	24 oz.	36 hr.	12 pt.	18 ft.
3.	140 min.	23 mo.	26 pk.	60 ft.

Reduce to higher denominations:

	a	*b*	*c*	*d*
4.	362 gills	742 in.	478 oz.	9264 oz.
5.	4864 sq. in.	895 yd.	189 cu. ft.	1860 sq. yd.
6.	148 pt. (liquid)	1684 hr.	375 sq. rd.	450 pt. (dry)

Change:

7. 2 yd. 1 ft. 8 in. to yards.
8. 3 gal. 2 qt. 1 pt. to gallons.
9. 8 bu. 3 pk. 4 qt. 1 pt. to bushels.
10. 8 hr. 20 min. to days.
11. 8 A. 120 sq. rd. to acres.
12. .3125 gal. to pints.
13. $\frac{3}{5}$ yr. to months and days.

Operations with Compound Numbers

Example 1: Find the sum of 6 yd. 2 ft. 2 in., 3 yd. 1 ft. 6 in., and 4 yd. 2 ft. 8 in.

WORK

6 yd.	2 ft.	2 in.
3	1	6
4	2	8
15	~~6~~	~~16~~
	0	4

15 yd. 0 ft. 4 in., *Ans.*

The sum of the inches = 16 in. = 1 ft. 4 in.

Write the 4 in. in the column of inches and add 1 ft. to the column of feet. The sum of the feet = 6 ft. = 2 yd. 0 ft. Write 0 in the column of feet, and add the 2 yd. to the column of yards. The sum of the yards = 15 yd. Write 15 in the column of yards.

Example 2: Subtract 2 bu. 2 pk. 7 qt. from 8 bu. 3 pk. 6 qt.

WORK

		14
8 bu.	3 pk.	~~6~~ qt.
2	~~2~~ 3	7
6	0	7

6 bu. 0 pk. 7 qt., *Ans.*

As 7 qt. cannot be subtracted from 6 qt., add 1 pk. or 8 qt. to 6 qt. 7 qt. + 7 qt. = 14 qt. Write 7 in the column of quarts.

Since 1 pk. was added to the 6 qt. in the minuend, add 1 pk. to the 2 pk. in the subtrahend so as not to change the value of the answer.

3 pk. + 0 pk. = 3 pk. Write 0 in the column of pecks.

2 bu. + 6 bu. = 8 bu. Write 6 in the column of bushels.

Example 3: Multiply 2 gal. 3 qt. 1 pt. by 7.

WORK

2 gal.	3 qt.	1 pt.
		7
20	~~24~~	~~7~~
	0	1

20 gal. 0 qt. 1 pt., *Ans.*

7 times 1 pt. = 7 pt. = 3 qt. 1 pt. Write 1 under the column of pints. Add the 3 qt. to the product of 3 qt. multiplied by 7. The result is 24 qt. or 6 gal. 0 qt. Write 0 under the column of quarts. Add the 6 gal. to the product of 2 gal. multiplied by 7, and write the result, 20 gal.

Example 4: Divide 28 yd. 2 ft. 9 in. by 15.

WORK

15)28(1
15
13
×3
39
+2
15)41(2
30
11
×12
132
+9
15)141(9$\frac{2}{5}$
135
6

1 yd. 2 ft. 9$\frac{2}{5}$ in., *Ans.*

Divide 28 yd. by 15. The quotient is 1 yd. and the remainder is 13 yd. Reduce the remainder to feet (13×3 ft.). Add the given 2 ft. to the product, 39 ft. Divide the sum, 41 ft., by 15. The quotient is 2 ft., and the remainder is 11 ft. Change the remainder to inches (11×12 in.), and add 9 in. to the product, 132 in. Divide the sum, 141 in., by 15.

The quotient is 9$\frac{2}{5}$ in.

The answer is 1 yd. 2 ft. 9$\frac{2}{5}$ in.

(To save time, multiply 13 by 3 instead of 3 by 13, and 11 by 12 instead of 12 by 11.)

Difference between dates.

Example 1: Find the number of days between June 3 and Aug. 12.

WORK

Number of days left in June, 27 da.
Number of days in July, 31 da.
Number of days in August, 12 da.
70 da., *Ans.*

Example 2: Find the time from April 6, 1919 to July 4, 1921.

WORK

yr.	mo.	da.
		34
1921	7	4
1919	4 5	6
2	2	28

2 yr. 2 mo. 28 da., *Ans.*

It is usual to consider 30 days to the month in compound subtraction. July 4, 1921 is the 1921st year, the 7th month, and the 4th day. April 6, 1919 is the 1919th yr., 4th month, and 6th day. Proceed as in subtraction of compound numbers.

☞ *To avoid mistakes make sure that you know your tables, write figures carefully and in the proper columns, and check all calculations.*

Add: [With pencil]

1. 8 rd. 2 yd. 6 in.
 4 9
 6 3 10

2. 5 gal. 2 qt. 1 pt.
 4 3 1
 6 3 0

Subtract:

3. 6 bu. 2 pk. 4 qt.
 2 3 6

4. 8 A. 121 sq. rd.
 3 140

Multiply:

	a	*b*
5.	4 gal. 2 qt. 1 pt. by 12	4 bu. 2 pk. 1 qt. by 8
6.	3 A. 40 sq. rd. by 8	8 yd. 1 ft. 6 in. by 9
7.	15 lb. 6 oz. by 20	10 gal. 3 qt. 1 pt. by 8

Divide:

8.	16 gal. 3 qt. by 5	30 bu. 3 pk. 1 qt. by 6
9.	12 yd. 2 ft. by 8	6 yr. 8 mo. 12 da. by 6
10.	64 lb. 8 oz. by 9	34 acres 100 sq. rd. by 8

11. How much is $\frac{3}{5}$ of 12 hr. 30 min.?
12. Divide 12 bu. 3 pk. 6 qt. by 6.

Find the difference in time between:

13. June 5, 1916 and Aug. 2, 1918
14. Sept. 9, 1917 and June 30, 1919
15. Oct. 5, 1916 and May 1, 1918
16. Mar. 12, 1905 and July 5, 1920
17. July 5, 1921 and Aug. 18, 1922
18. Sept. 7, 1921 and Oct. 31, 1922

19. April 16, 1921 and July 8, 1922

20. May 24, 1921 and Sept. 4, 1922

21. What date is 60 da. after Aug. 5, 1921?

22. What date is 90 da. after Mar. 10, 1920?

23. What date is 3 mo. after July 12, 1920?

24. What date is 8 mo. after May 15, 1921?

25. What date is 6 mo. 12 da. after Oct. 9, 1921?

PROBLEMS [With pencil]

1. If it required 3 qt. of corn a day to feed a farmer's chickens, how long did a load of 8 bu. 1 pk. 4 qt. of corn last him?

2. A peddler bought $2\frac{1}{2}$ bu. of chestnuts for $\$10\frac{3}{4}$ and sold them at \$.20 a quart. How much did he gain?

3. A dealer bought 4 gal. 2 qt. 1 pt. of vinegar at 4¢ a pint and sold it at 48¢ a gallon. What was his gain?

4. One day 1881 pint packages of peanuts were sold at the ball grounds. Express this sale in bushels, pecks, quarts, and pints.

5. A dairyman had 16 gal. 2 qt. of milk left in his cans. How many pint bottles was he able to fill with this quantity?

6. At the public golf links 645 pt. of milk were sold one day. How many gallons were sold?

7. A strip of carpet 27 in. long was cut from a runner $8\frac{1}{2}$ yd. long. How much was left?

8. A coal peddler bought a load of coal weighing 2 T. 5 cwt. at \$11 a ton and sold it during the winter at \$.70 per 100 lb. How much did he gain?

9. If $2\frac{1}{4}$ pk. of potatoes last a family a month, how many bushels does this family use in a year?

10. What is the cost of 4 yd. 27 in. of ribbon at 32¢ a yard?

11. How much must be paid for 9 lb. 8 oz. of cheese at 48¢ a pound?

12. How many bottles containing $2\frac{3}{4}$ oz. each can be filled with 55 lb. of salt?

13. If a bushel contains 2150.42 cu. in., how many cubic inches are there in a peck? in a quart?

14. What part of 5 bu. are 2 bu. 3 pk.?

15. What part of 1 mi. are 300 rd. 2 yd.?

16. What part of 35 gal. are 17 gal. 1 qt.?

17. A lady bought 8 pails of lard, each marked "Five Pounds." Upon weighing them she found that each weighed 4 lb. 10 oz. How many pounds did she lose?

18. An operator's time card states that 3 hr. 15 min., 4 hr. 25 min., 6 hr. 50 min., and 5 hr. 45 min. were spent on a certain job. How many hours were spent on the job?

19. If the average rate of speed of a train on an 8-hour run was 32 mi. 40 rd. 2 yd. per hour, what distance was covered?

20. How many tools, each weighing 12 oz., can be made from 240 lb. of metal, allowing nothing for waste?

21. What is the perimeter of a garden plot 12 ft. 8 in. long and 10 ft. 6 in. wide?

22. An automobile party left town at 9.30 A.M. and made its first stop 3 hr. 40 min. later. At what time did it stop?

23. Mr. Burns promised to pay a sum of money 4 mo. after July 12. On what day was the money due?

24. Albert is 5 ft. 7 in. tall and his sister Jane is 4 ft. 10 in. tall. What is the difference in their heights?

25. A train left at 9.25 A.M. and reached its destination at 2.10 P.M. How long did the trip last?

26. Rose is 14 yr. 5 mo. 12 da. old to-day. When was she born?

27. The United States entered the World War on April 6, 1917. How long ago was that?

28. On Nov. 11, 1918, the armistice terminating the World War was signed. How long ago was that?

29. A square field is 12 yd. 2 ft. 10 in. long. What is its perimeter?

30. If it takes, on the average, 1 hr. 18 min. to prepare a dozen hats, how long will it take to prepare 12 doz. hats?

31. A train leaving Saratoga at 3.10 P.M. arrived at Riverside, 50 miles distant, at 5.11 P.M. What was the average rate of speed per hour?

32. A train leaving Albany at 1.30 P.M. reached Montreal, 241 miles distant, at 10.30 P.M. What was the average rate of speed per hour?

33. A man owning 1600 A. 100 sq. rd. of land divided it up into 15 equal parcels (parts). What was the area of each parcel?

Find the cost of:

34. 18,000 ft. lumber at \$62.50 per M.

35. 48,000 envelopes at \$3.60 per M.

36. 18,500 lb. sugar at \$8.75 per C.

37. 1650 cu. ft. gas at \$1.20 per M.

38. 8700 cu. ft. gas at \$1.10 per M.

39. 1800 stamped envelopes at \$21.30 per M.

40. 18,000 lb. soft coal at \$9.50 per T. (of 2000 lb.).

41. 2400 lb. nut coal at \$10.25 per T. (of 2000 lb.).

42. 84 gross buttons at $8\frac{1}{2}$¢ a dozen.

THE METRIC SYSTEM

The system of weights and measures common in this country is known as the English system. It is used mainly in Great Britain and in the United States. The system of weights and measures used in nearly all of the European countries is known as the **metric system.** This system has a decided advantage in being based on the decimal scale. It is used in all countries for scientific measurements, because it is much more accurate. The English system has often been found inadequate in measuring certain things, particularly small quantities of drugs, metals, etc. The metric system is much easier to remember and handle, as it is a decimal system. Thus, it is much easier to remember our money table than our weight table, because it is based on a decimal scale. Compare the following tables:

10 mills = 1 cent	16 oz. = 1 lb.	12 in. = 1 ft.
10 cents = 1 dime	100 lb. = 1 cwt.	3 ft. = 1 yd.
10 dimes = 1 dollar	2000 lb. = 1 T.	5½ yd. = 1 rd., etc.

The metric system had its origin in France in 1799. The *meter* is the standard of measurement of this system. It is nearly a ten-millionth part of the distance from the equator to either pole. It is about 39.37 in. long.

The unit of length is the **meter.**

The unit of dry and liquid measures is the **liter.**

The unit of weight is the **gram.**

To a person in this country the all-important tables are those of length and weight; and in these the most important measures are the meter and the kilometer, the gram and the kilogram.

Units of measures that are *larger* than the base units are called by names with Greek prefixes (deka, 10; kilo, 1000; myria, 10,000). Thus, 1 dekameter = 10 meters, 1 kilometer = 1000 meters, etc.

Units of measures that are *smaller* than the base units are called by names with Latin prefixes (deci, $\frac{1}{10}$; centi, $\frac{1}{100}$; milli, $\frac{1}{1000}$). Thus, 1 decimeter = $\frac{1}{10}$ of a meter; 1 centimeter = $\frac{1}{100}$ of a meter, etc.

Metric Measures of Length

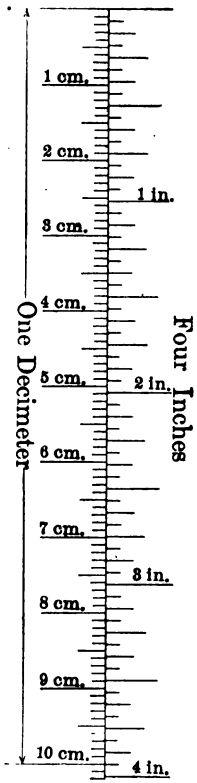
TABLE OF MEASURES OF LENGTH

1 *millimeter*	(mm.) = .001 meter
1 *centimeter*	(cm.) = .01 meter
1 decimeter	(dm.) = .1 meter
1 *meter*	(m.) = standard unit
1 dekameter	(Dm.) = 10 meters
1 hektometer	(Hm.) = 100 meters
1 *kilometer*	(Km.) = 1000 meters
1 myriameter	(Mm.) = 10,000 meters

10 millimeters	= 1 centimeter
10 centimeters	= 1 decimeter
10 decimeters	= 1 meter
10 meters	= 1 dekameter
10 dekameters	= 1 hektometer
10 hektometers	= 1 kilometer
10 kilometers	= 1 myriameter

The measures in italics are those commonly used.

Since this system of measures is a decimal system, units of any denomination may be reduced to the next *higher* denomination by moving the decimal point one place to the *left;* as, 256 meters = 25.6 Dm. = 2.56 Hm. = .256 Km. Units of any denomination may be reduced to the next *lower* denomination by moving the decimal point one place to the *right;* as, .256 Km. = 2.56 Hm. = 25.6 Dm. = 256 m.



Example: Reduce 18 Km. 4 Dm. 5 dm. 2 cm. to meters.

Work			Km.	Hm.	Dm.	m.	dm.	cm.
18 Km. =	18,000	m.	18	0	4	0.	5	2 =
4 Dm. =	40	m.						
5 dm. =	.5	m.						
2 cm. =	.02	m.						
	18,040.52	m.						

18040.52 m.

18 Km. 4 Dm. 5 dm. 2 cm. = 18,040.52 m., *Ans.*

(To reduce to higher denominations, move the decimal point to the left; to reduce to lower denominations, move the decimal point to the right.)

[Without pencil]

1. How many centimeters are there in a meter?
2. How many decimeters are there in 5 meters?
3. How many millimeters are there in 4 meters?
4. How many meters are there in 8 Km.?
5. How many meters are there in 12 Dm.?
6. How many meters are there in 10 Hm.?
7. How many meters are there in 4600 mm.?
8. How many meters are there in 360 cm.?

9. How many meters are there in 95 dm.?
10. How many meters are there in 8465 mm.?
11. How many meters are there in 1654 cm.?
12. How many meters are there in 842 dm.?
13. How many meters are there in 695 Dm.?
14. How many meters are there in 684 Hm.?
15. How many meters are there in 75 Km.?
16. How many meters are there in 765 cm.?
17. How many meters are there in 842 mm.?
18. How many millimeters are there in 12 Dm.?
19. How many centimeters are there in 5 Km.?
20. How many decimeters are there in 1 Km.?
21. How many millimeters are there in $\frac{1}{2}$ Km.?
22. How many centimeters are there in $\frac{1}{4}$ Km.?
23. How many meters are there in $\frac{3}{4}$ Km.?
24. How many decimeters are there in 800 cm.?
25. How many centimeters are there in 1500 mm.?
26. How many centimeters are there in 68 m.?
27. How many millimeters are there in 45 cm.?
28. How many decimeters are there in 800 mm.?
29. How many centimeters are there in 1600 mm.?
30. How many meters are there in 2400 mm.?

[With pencil]

Express as meters or decimal parts of a meter:

	a	*b*	*c*
1.	8 Dm.	1856 cm.	8 Km. 6 Dm. 4 m.
2.	6 Km.	32.5 dm.	8 Km. 4 m. 6 dm.
3.	18 cm.	165.5 cm.	8 Dm. 3 dm. 2 cm.
4.	4 dm.	485 m. 12 cm.	42 m. 28 cm.
5.	285 mm.	264 m. 5 dm. 4 cm.	76 m. 48 mm.

Example: Add 56 mm., 485 cm., 7 m., and 60 Km.

WORK

Writing them in the same unit, we have

56 mm.	=	.056 m.
485 cm.	=	4.85 m.
7 m.	=	7.00 m.
60 Km.	=	60,000. m.
		60,011.906 m., *Ans.*

The result may be reduced to any unit by merely changing the place of the decimal point.

6. Reduce 8 Km. 6 m. 2 cm. to centimeters; to decimeters; to dekameters.

7. Change 7.8 m. to millimeters; to kilometers; to centimeters.

8. Reduce 6.5 m. to kilometers; to millimeters.

Change to the next lower denomination:

	a	*b*	*c*	*d*	*e*
9.	8 m.	48 Km.	36 Dm.	480 dm.	92 cm.
10.	48 Hm.	96 m.	46 Km.	38 cm.	17 Dm.

Change to the next higher denomination:

11.	44 m.	68 cm.	156 Km.	52 Dm.	844 Hm.
12.	53 mm.	126 dm.	57 m.	162 dm.	582 cm.

13. Add 48 Km. 2 m. 4 dm., 16 Km. 4 m., and 28 Km. 3 Dm. 4 m. 5 cm.

14. Add 36 Km. 16 m. 4 dm. and 24 Km. 9 m. 8 cm.

15. A certain regiment advanced 4 Km. 16 m. in the morning and 6 Km. 12 m. in the afternoon. How far did it advance that day?

16. Jean walked 416.4 m. before lunch and 1.56 Km. in the afternoon. How much longer was his afternoon walk?

17. How many meters of braid are there in a roll containing 375 cm. of braid?

18. At $4.20 a meter, how much must be paid for 6 m. 75 cm. of cloth?

19. What part of a kilometer is 50 mm.? 50 cm.? 50 m.? 50 Dm.?

20. What part of a kilometer is 1.5 m.? 1.5 dm.? 1.5 mm.?

21. What part of a meter is 1.4 cm.?

22. What is the difference in millimeters between 4.5 m. and 45.2 mm.?

23. If I paid $50 for 12 m. of silk, what was the value of 4 dm. at that rate?

Here are some **approximate equivalents** worth knowing. Try to remember them. Refer to them when necessary.

1 m.	= 39 in. or $3\frac{1}{4}$ ft.
1 Km.	= $\frac{5}{8}$ mi.
1 mile	= $\frac{8}{5}$ Km.
Diameter of a nickel	= 2 cm.

Change:

	a	*b*
24.	10 mi. to kilometers.	48 Km. to miles.
25.	50 yd. to meters.	1600 mm. to inches.
26.	2 Km. to yards.	100 m. to yards.

27. Express the dimensions of your classroom in yards and then in meters.

28. The French army used two kinds of guns during 1917 and 1918. One was 75 mm. wide and the other 155 mm. wide. Express these dimensions in inches.

29. A report of the French government read: "Paris, Aug. 19, 1918—The attack was over a front of 15 Km. from south of Carlepont to Fontenoy." How many miles was that?

30. The following is a British report: "London, Aug. 19—Our advance has continued in the Merville sector (Lys salient). Considerable progress has been made on a front of 10,000 yd." How many kilometers was this front? how many miles?

31. The American Army in Picardy, France, made an advance of 2.4 Km. one day. How many miles did it advance?

32. At the Olympic Games held at Antwerp in 1920, 100-meter, 200-meter, 1000-meter, and 1500-meter races were run instead of 100-yard, 220-yard, $\frac{1}{2}$-mile, and 1-mile races. Which were the longer races, and how many yards longer were they?

Change meters to kilometers and use 1 Km. = $\frac{5}{8}$ mi. = $\frac{5}{8}$ of 1760 yd. = 1100 yd.

33. An importer bought 200 m. of silk at \$1.50 per meter and sold it at \$2 a yard. How much did he gain?

34. A field is 48 Dm. wide and 80 Dm. long. How many miles is it around it?

35. A boy is 1 m. 20 cm. tall. How tall is he according to our measure?

36. The Eiffel Tower is 300 m. high and the Metropolitan Tower is 700 ft. high. Which is taller and by how much?

37. An airplane rose 1600 m. How many feet did it rise?

38. Silk bought in France for \$1.20 (about 6 francs) a meter was sold in the United States at \$1.40 a yard. What was the profit on 45 m.?

39. An importer bought a lot of 720 m. of velvet at 20 francs a meter and sold it at \$5 per yard. How much did he gain? (1 franc = 20 cents.)

40. The Public Schools Athletic League games are held every year. There are 50-yard, 60-yard, 70-yard, and 100-yard dashes. If similar races were held in France, how many meters would each amount to?

41. Two trains are 96 Km. apart. How many miles are there between them?

42. The distance from Bapaume to Cambrai is 14 mi. How many kilometers apart are they?

43. An airplane traveled 45.5 mi. How many kilometers did it travel?

44. In one sector of the battlefield the French Army placed 488 Km. of barbed wire. How many miles of barbed wire did they use there?

45. The English Army used 560 mi. of barbed wire on one battlefield. How many kilometers of wire were used there?

46. On May 9, 1919, the United States navy airplane NC–4 started from New York for a trip across the Atlantic Ocean. It flew to Halifax, 540 mi. distant, then to Trepassey Bay, Newfoundland, 460 mi. from Halifax, then 1200 mi. to the Azores, then 800 mi. to Lisbon, and finally 775 mi. to Plymouth. What distance in kilometers did it cover?

47. What is the difference in inches between 5 m. and 5 yd.?

48. What is the difference in miles between 16 mi. and 16 Km.?

Metric Measures of Surface

The primary unit of **surface** is the **square meter.**

Just as a square foot may be said to be made up of 144 smaller squares, each 1 in. on a side, so a *square meter* may be said to be made up of 100 smaller squares, each 1 dm. on a side.

TABLE OF SQUARE MEASURES

1 sq. mm. = .000001 sq. m.	100 sq. mm. = 1 sq. cm.
1 *sq. cm.* = .0001 sq. m.	100 sq. cm. = 1 sq. dm.
1 sq. dm. = .01 sq. m.	100 sq. dm. = 1 sq. m.
1 *sq. m.* = unit	100 sq. m. = 1 sq. Dm.
1 sq. Dm. = 100 sq. m.	100 sq. Dm. = 1 sq. Hm.
1 sq. Hm. = 10,000 sq. m.	100 sq. Hm. = 1 sq. Km.
1 *sq. Km.* = 1,000,000 sq. m.	

The *square meter* is used for measuring ordinary surfaces, and the *square kilometer* is used for measuring larger surfaces.

In the measurement of land the principal unit is the **are**, which is a square dekameter. The square meter or centare is $\frac{1}{100}$ of an are.

100 centares = 1 are
100 ares = 1 hektare

Note that in the square measure table each unit is 100 times as large as the next smaller unit. In the table of measures of length it is only 10 times as large. Therefore, to change from one unit to the next, move the decimal point two places to the right or to the left.

Equivalents: 40 ares = 1 acre 1 hektare = $2\frac{1}{2}$ acres

Reduce to square meters: [Use pencil when needed]

	a	*b*	*c*	*d*
1.	84 sq. dm.	65 sq. Dm.	540 sq. cm.	85 sq. Hm.
2.	3 sq. Km.	40 ares	.5 are	16.4 sq. dm.

3. Change 4 sq. m. 6.5 sq. dm. to square centimeters.
4. Change 4 sq. Dm. 180 sq. cm. to square decimeters.
5. How many square centimeters are there in 25 sq. Km.?
6. How many square meters are there in a rectangle 80 dm. wide and 3.5 Dm. long?

7. A field is 140 m. wide and 150 m. long. Find its area in square meters; in ares.

8. If land is worth $5.00 an are, what is the value of a strip of land 80 m. wide and 200 m. long?

9. A field is 1 Hm. square. How many ares are there in it?

10. A field is 4 Km. wide and 5 Km. long. Find its area in hektares and in acres.

Metric Measures of Volume and Capacity

The primary unit of volume is the **cubic meter.**

The primary unit of capacity is the **liter.**

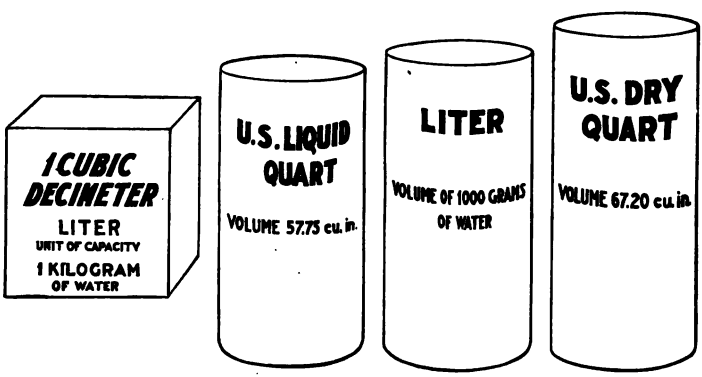


TABLE OF CUBIC MEASURES

1 cu. mm. = .000000001 cu. m.	1000 cu. mm. = 1 cu. cm.
1 cu. cm. = .000001 cu. m.	1000 cu. cm. = 1 cu. dm.
1 cu. dm. = .001 cu. m.	1000 cu. dm. = 1 cu. m.
1 *cu. m.* = unit	

Note that each unit is 1000 times as large as the next smaller unit.

The *liter* is a cube 1 dm. on a side. It contains 1 cu. dm. or 1000 cu. cm. It is $\frac{1}{1000}$ cu. m.

TABLE OF MEASURES OF CAPACITY

1 milliliter (ml.) = .001 liter	10 milliliters = 1 centiliter
1 centiliter (cl.) = .01 liter	10 centiliters = 1 deciliter
1 deciliter (dl.) = .1 liter	10 deciliters = 1 *liter*
1 *liter* = unit	10 liters = 1 dekaliter
1 dekaliter (Dl.) = 10 liters	10 dekaliters = 1 hektoliter
1 hektoliter (Hl.) = 100 liters	10 hektoliters = 1 kiloliter
1 kiloliter (Kl.) = 1000 liters	

Equivalents

1 liter = 1.05 qt. (liq.)	1 hektoliter = 2.8 bu. (about 3 bu.)
= .908 qt. (dry)	1 cu. m. = 1.3 cu. yd.

[Use pencil when needed]

1. How many cubic centimeters are there in a cube 1 dm. long?

2. How many cubic meters are there in 425 cu. dm.?

3. Find the volume of a bin 4 m. long, 3 m. wide, and 8 dm. deep.

4. A tin box is 60 cm. long, 50 cm. wide, and 40 cm. deep. Find its contents in cubic centimeters. How many liters can it hold?

5. A tank is 4 m. long, $2\frac{1}{2}$ m. wide, and 1 m. deep. How many liters can it hold when full?

6. How much will it cost to build a wall 4.5 dm. thick, 4.5 m. high, and 1 Km. long at 50¢ a cubic meter?

7. A cask holds 2 Hl. 4 Dl. 2 l. of oil. How much is the oil worth at 80¢ a liter?

8. If a liter of molasses is worth 12¢, what is the value of 8 Hl. 4 Dl. 2 l. of molasses?

9. A bin is 8.5 m. long, 80 dm. wide, and 25 dm. deep. Find its capacity in liters; in bushels.

10. A cellar 10 m.$\times$15 m.$\times$2 m. is to be excavated. How much will it cost at 10¢ per cubic meter to do the work?

11. A tank contains 8.5 cu. m. What is its capacity in liters?

12. How many cubic meters are there in a wall 40 m. long, 15.5 dm. high, and 85 cm. thick?

13. A vat contained 40 l. of water. How many gallons did it hold?

Change:

	a	*b*
14.	20 l. to quarts	.30 l. to gallons
15.	5 gal. to liters	12 gal. 2 qt. to liters

16. How many cubic meters of water are there in a tank containing 218$\frac{3}{4}$ l.?

17. If there are 15 kiloliters in a car, how many cubic meters does it hold?

Metric Measures of Weight

The primary unit of weight is the **gram**.

The **gram** is the weight of a *cubic centimeter* of pure water.

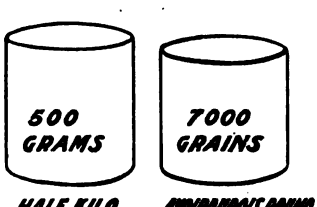




TABLE OF MEASURES OF WEIGHT

1 milligram (mg.)	= .001 of a gram
1 centigram (cg.)	= .01 of a gram
1 decigram (dg.)	= .1 of a gram
1 *gram*	= unit
1 dekagram (Dg.)	= 10 grams
1 hektogram (Hg.)	= 100 grams
1 *kilogram* (Kg.)	= 1000 grams
1 metric ton	= 1000 kilograms
10 milligrams	= 1 cg.
10 centigrams	= 1 dg.
10 decigrams	= 1 g.
10 grams	= 1 Dg.
10 dekagrams	= 1 Hg.
10 hektograms	= 1 Kg.
1000 kilograms	= 1 metric ton

Interesting Facts to Remember

1. Our nickel or 5-cent piece weighs 5 grams.
2. The gram is used in weighing precious metals and medicines.
3. A cubic centimeter of water weighs a gram.
4. A liter of water weighs a kilogram.
5. A cubic meter of water weighs a ton or 1000 Kg.
6. A kilogram is about $2\frac{1}{5}$ lb.
7. A metric ton is about 2200 lb.
8. A kilogram is often called a kilo.

☞ *Check all work to test the correctness of answers.*

Reduce: [Use pencil when needed]

a	*b*
1. 4 Kg. to grams.	4 Dg. 3 g. to centigrams.
2. 3 Kg. 45 g. to grams.	8 metric tons 6 Kg. to grams.

3. A grocer in France sold sugar one day as follows: 68 Kg., 45.8 Kg., 35 g., 18.2 g., and 4 Kg. How many grams did he sell?

4. What is the weight of 4 cu. m. of water?

5. Change 20 kilos to pounds.

6. Change 50 lb. to kilos.

7. Change 2 T. to kilos.

8. Change 5000 kilos to metric tons; to tons.

9. Change 4.5 metric tons to hektograms.

Find the weight in pounds:

10. Of a load of iron weighing 50 kilos.

11. Of a bag containing 20 g. of powder.

12. Of 8 Hg. of nuts.

13. A quantity of cheese weighing 600 Kg. was imported from Holland. How many pounds were imported? how many tons?

14. John's brother was surprised to find that the scale registered $85\frac{1}{2}$ when he weighed himself in Paris. He soon learned it was kilos. How many pounds did he weigh?

15. Raoul, the strongest boy in school in Rouen, France, could lift a dead weight of 35 Kg. with one hand. How many pounds could he lift?

16. On Aug. 15, 1918, Mr. Hoover said it would be necessary to send the Allies for the year beginning Sept. 1, 1918:

a. 4,000,000,000 lb. of fats and vegetable oils.

b. 1,500,000 T. of sugar.

c. 900,000,000 lb. of beef products.

Express each of these amounts in kilograms and in metric tons.

17. The Athletic Association held games for boys weighing 85 lb., 95 lb., and 115 lb. Express these weights in kilos.

REVIEW PROBLEMS

[Use pencil when needed]

☞ *Read the example carefully. Note what is required. Check all work.*

1. What part of a meter is 1.5 cm.?

2. What is the difference in millimeters between 5.4 m. and 96.2 mm.?

3. Express in meters: 8 Km., 4 mm., 7 Hm., 8 cm., 5 Dm.

4. Change to meters and then add: 4.56 Km., 4 Km., 81 cm., 215 mm.

5. How many inches are there in 10 m.?

6. A tank is 8 m. by 4 m. by 3 m. How many grams of water will it hold?

7. Reduce 450.5 cg. to milligrams; to kilograms; to grams.

8. What is the weight of 35 cu. cm. of water?

9. What is the weight of 48 l. of water?

10. The distance from Saratoga to Schenectady is 22 mi. Express this distance in kilometers.

11. How many kilograms of flour are there in a barrel of flour weighing 196 lb.?

12. A new world's record for an automobile was made on Aug. 16, 1918, by De Palma, who rode 10 mi. in 5.23⅘ min. This was at the rate of 114 mi. per hour. Express this in kilometers per hour.

13. Express your weight in kilograms.

14. What is the prefix that means 10? 100? $\frac{1}{10}$? 1000? .01?

15. What part of a liter of water is 100 g. of water?

16. How many kilos does a hektoliter of water weigh?

17. What part of a square meter is a square decimeter?

18. How many gallons of water are there in a cubic meter of water?

19. A receipt for cookies in a French cookbook called for 300 grams of sugar. What approximate part of a pound of sugar was required?

SUGGESTION. What part of a kilogram ($2\frac{1}{5}$ lb.) are 300 grams?

20. If 1 yd. 18 in. of ribbon is desired, how many meters must a lady ask for in France?

21. The troopship *Mount Vernon* was torpedoed 200 mi. from the French coast. How many kilometers was she from the coast?

22. The ship was 685 ft. long and had a tonnage of 19,500 tons. Find the length in meters, and the tonnage in metric tons.

23. How many kilometers does a boy travel in walking 60 city blocks? (Count 20 blocks to the mile.)

24. If in going from Paris to Versailles it took 5 hr. to travel 88 Km., what was the rate per hour in miles?

25. The Black Diamond Express travels 55 mi. an hour. How many kilometers does it cover in 5 hr. at this rate?

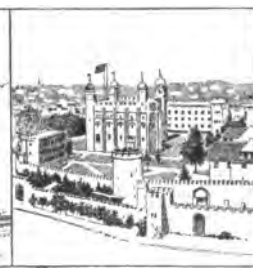
26. At the Athletic Games held in Paris in August, 1918, by our American soldiers, Sergeant Jim Duncan, a New Yorker, threw the discus 45 m. 48 cm., creating a new world's record. Express this distance in feet.

27. A French "ace" flew 120 Km. in 1 hr. 15 min. in his airplane. How many miles per hour did he travel?

FOREIGN MONEY



EIFFEL TOWER, PARIS



TOWER OF LONDON



FORUM, ROME

The money used in other countries is different from that used in our own country. In fact, almost every country in the world has a money system of its own.

A person landing in England with American money in his possession goes at once to some banking institution to have his American money exchanged for English money equivalent in value. In like manner an Englishman landing in the United States must exchange his English money for its equivalent in American money. The following table shows the normal values of the common foreign coins with which Americans should become familiar. These values change daily and are recorded in our daily newspapers.

COIN	COUNTRY	NORMAL VALUE IN UNITED STATES	APPROXIMATE NORMAL VALUE IN U. S.
Franc (fr.) *	France	$.193	$.20
Pound (£)	Great Britain	4.8665	5.00
Shilling (s.)	Great Britain	.243	.25
Mark (M.)	Germany	.238	.25
Lira	Italy	.193	.20
Ruble	Russia	.5146	.50
Krone †	Denmark	.268	.25

* Used also in Belgium and Switzerland.
† Used also in Sweden and Norway.

TABLE OF ENGLISH MONEY (Sterling Money)

4 farthings (far.) = 1 penny (*d.*)
12 pence = 1 shilling (*s.*)
20 shillings = 1 pound (£) or sovereign
21 shillings = 1 guinea
5 shillings = 1 crown

(£ is always written before the figure as is $.)

Canada uses the same denominations as the United States.

1 pound (£) = $5 (approximate)
1 shilling = 25¢ (approximate)
1 penny = 2¢ (approximate)

TABLE OF FRENCH MONEY

100 centimes (c.) = 1 franc (fr.)
5 centimes = 1¢ (approximate)

TABLE OF GERMAN MONEY

100 pfennigs (pf.) = 1 mark (M.)
4 pf. = 1¢ (approximate)

[Use pencil when needed]

1. Into what money unit would you change your money upon arriving in Rome? in Paris? in London?

Find the values of the following in United States money. (Use the approximate normal values.)

	a	*b*	*c*
2.	£4	20 fr.	10 M.
3.	240 fr.	£10 4*s.*	£5 10*s.*
4.	50 pf.	£6 5*s.*	20 fr. 50 c.
5.	10*s.*	25 lire	50 fr.
6.	60 M.	5 fr. 50 c.	130 lire
7.	20 M. 50 pf.	10*s.* 5*d.*	40 rubles

Copy and write the approximate equivalents in the proper spaces:

United States	English	French	German	Italian
8. $10				
9. $30				
10. $1000				
11. $5				
12. $100				
13. $20				
14. $.50				
15. $1.75				
16. $3.50				
17. $5000				
18. $2050				

To find the exact value of foreign money in United States money.

Example 1: What is the exact equivalent of £10 6*s*. 6*d*. in United States money at the normal rate?

Work

$6d. = \frac{6}{12}s. = .5s.$

$6.5s. = £\frac{6.5}{20} = £.325$

£10 6*s*. 6*d*. = £10.325.

Since £1 = $4.8665,

£10.325 = 10.325 × $4.8665

= $50.246, or $50.25, *Ans.*

Reduce £10 6*s*. 6*d*. to pounds, and then multiply the equivalent for a pound by the number in the result.

Disregard less than .5¢ and count as an extra cent .5¢ or a greater decimal of a cent.

Example 2: Find the exact value of 20 fr. 50 c. in United States money at the normal rate.

WORK

20 fr. 50 c. = 20.5 fr.
20.5 × $.193 = $3.9565 = $3.96, *Ans.*

Reduce the amount to francs and then multiply $.193 by the result.

Example 3: Find the exact value of 40 M. 60 pf. in United States money at the normal rate.

WORK

40 M. 60 pf. = 40.6 M.
40.6 × $.238 = $9.6628 = $9.66, *Ans.*

Reduce the amount to marks and then multiply $.238 by the result.

[With pencil]

Find the exact values of the following in United States money at the normal rate:

	a	*b*	*c*
1.	£2 10*s.*	40 fr.	25*s.*
2.	£25	20 M.	50 fr. 50 c.
3.	£12 5*s.*	900 fr.	20 M. 50 pf.
4.	£5 10*s.* 6*d.*	250 lire	300 fr.

To find the exact value of United States money in foreign moneys.

Example 1: Find the exact value of $1000 in French money at the normal rate.

WORK

$1000 ÷ $.193 = 5181.347 = 5181.35, number of francs. .35 fr. = 35 c.
Therefore $1000 = 5181 fr. 35 c., *Ans.*

Since 1 fr. = $.193, the number of francs = $1000 ÷ $.193.

Example 2: Find the exact value of $100 in English money at the normal rate.

WORK

$100 ÷ $4.8665 = 20.548, number of pounds
£.548 = .548 × 20*s.* = 10.96*s.* = 11*s.*
Therefore $100 = £20 11*s.*, *Ans.*

Since £1 = $4.8665, the number of pounds = $100 ÷ $4.8665.

[With pencil]

Find the exact equivalents of the following sums in the money indicated.

	English	French	German	Russian
1. $80				
2. $50				
3. $400				
4. $1000				
5. $560				
6. $1250				
7. $10				
8. $200				

☞ For practical purposes the *approximate values* are used. Unless the exact equivalent is called for, use the approximate value.

The values change from time to time, depending on conditions. Thus, during the World War and directly after the war the value of certain coins was much less than the normal value. A ruble in 1918 was worth but $.14, and a pound sterling was worth $4.75 in 1918 and $3.98 in 1919. The values are reported daily on the financial sheet of every newspaper.

The following values were published on Jan. 21, 1921:

Normal Value		Value Jan. 21, 1921
$4.8665	Pound, sterling (England)	$3.76
19.30 cents	Franc (France)	6.52 cents
19.30 cents	Franc (Switzerland)	15.65 cents
19.30 cents	Lira (Italy)	3.52 cents
23.80 cents	Mark (Germany)	1.64 cents

It will be noted that the value of an English pound on Jan. 21, 1921, was \$3.76; of a French franc, $6\frac{1}{2}$ cents; of an Italian lira, $3\frac{1}{2}$ cents; of a German mark, $1\frac{3}{5}$ cents.

What are the values given in to-day's papers?

(Unless otherwise told, use the *normal* approximate values.)

[With pencil]

1. Name the foreign coin approximately equal to 25¢ in value; to \$5; to 20¢; to 50¢.

Give the approximate value of:

	a	*b*
2.	75¢ in English money	\$3 in French money
3.	\$6 in German money	30¢ in English money
4.	\$2 in Russian money	\$45 in German money
5.	\$20 in Italian money	60¢ in Swiss money

6. (*a*) Change £.125 to shillings and pence. (*b*) Change 2*s.* 6*d.* to a decimal of a pound.

7. (*a*) Change £.375 to shillings and pence. (*b*) Change 6*s.* 6*d.* to a decimal of a pound.

8. I sent my brother in London a money order for \$50. How much was he able to get for it in English money?

9. A traveling salesman wished to change his money into English money on board an English steamer. How much did he receive for \$600 at the normal rate of exchange?

10. Sergeant Curran, when in Paris, exchanged his United States money for French money. How much did he get for \$40?

11. A French sailor on shore leave in San Francisco had his money exchanged for United States money. How much did he get for 40 fr. 50 c.?

12. Tony Aiello sent his parents in Italy $10 every month. How many lire did they get in exchange?

13. His cousin landed in Boston in 1913 with 250 lire in his pockets. How many dollars did he get in exchange?

14. When Lucy's mother was in Paris she bought a lace robe for 150 fr. How many dollars did it cost her?

15. Before the World War the daily wage of a workman in Russia was 1 ruble to $1\frac{1}{2}$ rubles. In 1917 it was $7\frac{1}{2}$ rubles to 15 rubles, and in 1918 it was 125 rubles to 150 rubles. Express these values in dollars and cents.

16. When Corporal Allen was in London he paid 2*s.* 6*d.* for a theater ticket. How much is that in our money?

17. When Henry's folks were in Rome they rewarded a certain guide with 3 lire. How much is this in our money?

18. An Englishwoman visiting friends in New York in 1918 found she had to pay $7.50 for a train ride from New York to Riverside. To how much of her own country's money is this equal?

19. Certain goods could be bought in England for £5 10*s.*, and in France for 140 fr. Which was the better offer for an American, and why?

20. Our American soldiers joined with the French in celebrating Bastille Day, July 14, 1918. Private Thompson spent 4 fr. 20 c. that day. How much was this in dollars and cents?

21. A tourist's expenses during three days in Germany in 1912 amounted to 56 M. 50 pf. How much was this in United States money?

22. A certain hotel in Switzerland charged 18 fr. per day. What was Mr. Morton's board bill in United States money if he stopped there for 5 da.?

PERCENTAGE

The part of arithmetic that treats of per cents is called **percentage.**

1. What is meant by per cent?

2. What is the sign for per cent?

3. Express 5 per cent in three other ways.

4. How many per cent are there in any unit?

5. Read as per cents: $\frac{16}{100}, \frac{5}{100}, \frac{62\frac{1}{2}}{100}, \frac{135}{100}, \frac{200}{100}, \frac{7}{200}, \frac{11}{200}, \frac{17}{300}$.

6. Read as per cents: .08, .64, .825, 1.50, .120, .08⅔, .003, 6.4, 18, 7, .005, 1.75.

7. Read or write as decimals: 6%, 7½%, 20%, ¼%, 100%, 250%, ⅛%, 750%, 18⅔%, $\frac{1}{10}$%.

8. Write each of these in two other ways: $\frac{7}{100}$, 16%, 75%, .05, 7½%, 450%, .8, 5.5.

Note that $5.4\% = \frac{5.4}{100} = .054 = 5\frac{2}{5}\%$

9. Write as decimals: 8%, 2¼%, 350%, 62½%, 850%, ⅕%, .5%, .2%, ⅛%, 35¼%, 18 per cent, ⅓ per cent, 240 per cent, ¾, ⅝, ⅝, ⅔, ⅜.

Example: Express as decimals and per cents: (*a*) ¾; (*b*) 6.

WORK

(*a*) ¾ = 3 ÷ 4 = .75 or 75%, *Ans.*

(*b*) 6 = 6. = 6.00 or 600%, *Ans.*

$$4\overline{)3.00}$$
.75

10. Express as per cents: $\frac{5}{100}, \frac{9}{10}, \frac{3}{100}$, ⅘, ⅞, ⅝, ½, 2¼, ⅚, ⅞, 12½, $\frac{1}{50}$, 3⅓, 6⅔, ¼, 2⅕.

11. Copy this table and fill in the missing numbers:

$\frac{1}{2} =$ —— %	$\frac{1}{5} =$ —— %	$\frac{1}{10} =$ —— %	$\frac{1}{20} =$ —— %
$\frac{1}{3} =$ —— %	$\frac{1}{6} =$ —— %	$\frac{1}{12} =$ —— %	$\frac{1}{30} =$ —— %
$\frac{1}{4} =$ —— %	$\frac{1}{8} =$ —— %	$\frac{1}{16} =$ —— %	$\frac{1}{40} =$ —— %

12. Copy these tables and fill in the missing numbers:

$\frac{2}{3} =$ —— %	$\frac{3}{5} =$ —— %	$\frac{3}{8} =$ —— %	$\frac{5}{12} =$ —— %
$\frac{3}{4} =$ —— %	$\frac{4}{5} =$ —— %	$\frac{5}{8} =$ —— %	$\frac{5}{16} =$ —— %
$\frac{2}{5} =$ —— %	$\frac{5}{6} =$ —— %	$\frac{7}{8} =$ —— %	$\frac{1}{40} =$ —— %

(Common fraction)	(Common fraction)	(Common fraction)	(Common fraction)
75 % = ——	4 % = ——	$2\frac{1}{2}$ % = ——	$12\frac{1}{2}$ % = ——
80 % = ——	$62\frac{1}{2}$ % = ——	$16\frac{2}{3}$ % = ——	$37\frac{1}{2}$ % = ——
20 % = ——	$83\frac{1}{3}$ % = ——	125 % = ——	$66\frac{2}{3}$ % = ——
60 % = ——	5 % = ——	150 % = ——	50 % = ——
$33\frac{1}{3}$ % = ——	40 % = ——	$87\frac{1}{2}$ % = ——	25 % = ——

Find the sums and express them in decimal form:

13. 34%, 250%, 6%, $17\frac{1}{2}$%, $\frac{3}{4}$%, and $2\frac{3}{4}$%.

14. 32%, 5%, 375%, 106%, $1\frac{7}{8}$%, and $\frac{1}{8}$%.

15. $2\frac{3}{4}$%, $7\frac{1}{2}$%, $6\frac{1}{4}$%, $\frac{1}{2}$%, 150%, and 75%.

16. .6%, .5%, 2.5%, 3.6%, and 180%.

Finding a per cent of a number.

The **base** (B) is the number of which a certain per cent is taken.

The **rate** (R) is the number of hundredths (per cent) of the base to be taken.

The **percentage** (P) is the number obtained by taking a certain per cent of the base.

The **amount** is the sum of the base and the percentage.

The **difference** is the difference between the base and the percentage.

☞ *Remember:*

To find a per cent of a number change the per cent to its decimal or fractional equivalent, and proceed as in finding a fractional or a decimal part of a number.

Example: Find 25% of \$800.

WORK

We know that $R \times B = P$

Whenever the per cent can be *easily* changed to a simple fraction, the work in finding the percentage can be shortened.

Substitute the values of the terms given:

Long way	Short way
$.25 \times \$800 = P$	$\frac{1}{4} \times \$800 = P$
\$800	200
.25	
\$200.00, P, *Ans.*	$P = \$200$, *Ans.*

☞ *Remember:*

In finding the percentage, the amount, or the difference, the shortest method is the best method.

Very often time can be saved by finding the value of 1% of the base, and then multiplying by the number represented by the given rate. Thus, 1% of \$800 = \$8; 6% of \$800 = $6 \times \$8 = \$48$.

[Without pencil]

1. Name the terms given and required in the following examples:

a. John had \$50 and spent 10%. How much did he spend?

b. Esther found that 20% of her money was enough to pay for her dress. If she had \$80, how much did she pay for her dress?

c. George found that 6% of his money was $12. How much money had he?

d. Mary found that 25% of the money she had in the school bank was $2. How much had she in the bank?

2. Find the missing numbers in the following:

	BASE	RATE	PERCENTAGE
a.	72	10%	?
b.	300	30%	?
c.	400	75%	?
d.	$600	$83\frac{1}{3}\%$	?
e.	60 boys	$33\frac{1}{3}\%$	?
f.	$ 72	$12\frac{1}{2}\%$	?
g.	1000	$\frac{1}{5}\%$	?
h.	2400	$\frac{1}{4}\%$	?

3. Copy, and fill in the missing numbers in the proper spaces:

	Find	50	20	10	5	12	8	30	40
a.	8% of								
b.	20% of								
c.	50% of								
d.	$\frac{1}{2}\%$ of								
e.	$12\frac{1}{2}\%$ of								
f.	.1% of								
g.	150% of								
h.	200% of								

☞ *Read the example carefully. Note what is required. Check all work.*

Find: [Use pencil when needed]

	a	*b*
1.	8% of \$120	.3% of \$620
2.	15% of 1200 pupils	250% of 72 yd.
3.	$6\frac{1}{4}$% of \$3200	500% of \$84
4.	$8\frac{2}{3}$% of 360 yd.	2.4% of \$3700
5.	$\frac{7}{8}$% of 784 ft.	$\frac{2}{5}$% of 3500 children

Use the shortest method you know in finding the percentage in the following:

	a	*b*
6.	$87\frac{1}{2}$% of \$2400	250% of \$200
7.	$62\frac{1}{2}$% of \$1600	175% of \$100
8.	60% of \$7500	$12\frac{1}{2}$% of \$30
9.	20% of \$400	80% of \$75
10.	125% of \$1000	$2\frac{1}{2}$% of \$4000

Give the difference between:

11. $\frac{1}{2}$ of my money and $\frac{1}{2}$% of my money.
12. $\frac{3}{4}$ of my money and $\frac{3}{4}$% of my money.
13. $1\frac{1}{4}$ times a number and $1\frac{1}{4}$% of that number.
14. 2 times a number and 250% of that number.

Tell the shortest way of finding:

	a	*b*
15.	10% of a number.	150% of a number.
16.	5% of a number.	15% of a number.
17.	20% of a number.	$\frac{1}{4}$% of a number.

Tell the shortest way of finding:

	a	*b*
18.	50% of a number.	$\frac{3}{8}$% of a number.
19.	125% of a number.	250% of a number.

Find in the shortest way:

☞ In computations in percentage and interest and their applications, discard less than $\frac{1}{2}$¢ in the result and count $\frac{1}{2}$¢ or a greater part of a cent as an extra cent.

	a	*b*
20.	10% of \$760	$\frac{1}{8}$% of \$600
21.	10% of \$375	$1\frac{1}{2}$% of \$600
22.	10% of \$600	250% of \$600
23.	5% of \$600	10% of \$840
24.	15% of \$600	5% of \$840
25.	20% of \$600	20% of \$750
26.	50% of \$600	$\frac{1}{3}$% of \$360
27.	150% of \$600	$\frac{5}{8}$% f \$160

To find the **amount** add the percentage to the base.
To find the **difference**, subtract the percentage from the base.

Find the missing terms: [With pencil]

	Base	Rate	Percentage	Amount	Difference
1.	\$ 175	$6\frac{1}{2}$%	?	?	—
2.	\$1200	32%	?	?	—
3.	\$6400	$12\frac{1}{4}$%	?	—	?
4.	\$1675	8.2%	?	?	—
5.	\$ 175.60	160%	?	?	—
6.	\$3810.75	$32\frac{1}{4}$%	?	—	?
7.	\$1147.60	43%	?	—	?
8.	\$ 21.72	7%	?	?	—

Find:

9. $8\frac{3}{4}\%$ of \$1750.60; of \$847; of \$1500.75.

10. $7\frac{1}{2}\%$ of \$1600; of \$580.50; of \$68.75.

11. $\frac{5}{8}\%$ of \$750; of \$1600.80; of \$275.40.

In finding the *amount* it is sometimes easier to *add* the given rate per cent to the base (100%) and then multiply the base by the resulting figure; and in finding the *difference* it is sometimes easier to *subtract* the given rate per cent from the base and then multiply the base by the resulting figure.

Example 1: Last year a man received a salary of \$1200, which was increased 10% this year. What salary does he receive this year?

WORK

Required — To find the *amount*.

Amount	= base plus percentage
Base	= \$1200 = 100% of base
Rate %	= 10% of base
Amount (new salary)	= 110% of base
	$= \frac{11}{10}$ of or $1.1 \times \$1200 = \$1320$, *Ans.*

Example 2: A girl had \$50 in the bank and drew out 20% of it. How much had she left?

Required — To find the *difference*.

Difference	= base minus percentage
Base	= \$50 = 100% of base
Rate	= 20% of base
Difference (money left)	= 80% of base = .8 or $\frac{4}{5}$ of \$50 = \$40, *Ans.*

In the following examples, tell what per cent of the base the required number is:

12. I had \$5000; I spent 50% of it. How much was left?

13. 25% of a shipment of 5000 oranges were frozen and thrown away. How many were left?

14. A man increased his capital of $4000 by 20%. What amount had he then?

15. The register of a school was 1200 on June 30. It decreased 5% on Feb. 1. What was the register on Feb. 1?

16. The base is $60; the rate is 15%. Find the amount; the difference.

17. Fred spent 60% of the 50¢ he received from his father. How much had he left?

18. $2\frac{1}{2}$% of a school were absent on Friday. If there were 1500 pupils on the school register, how many children were present?

19. The receipts of a store the first month were $1500. The following month they were 12% greater. What were the receipts the following month?

20. Of the 600 men employed in a factory $8\frac{1}{3}$% were discharged. How many remained?

21. Jane's reader has 70 pages; Ann's has 20% less. How many pages are there in Ann's reader?

PROBLEMS [Without pencil]

1. Of the 65 classes in our school, 20% had a perfect attendance on Wednesday. How many classes had a perfect attendance that day?

2. There are 520 pupils in the upper grades of our school. Of these 30% are in the seventh grade. How many pupils are there in the seventh grade?

3. Class A has a register of 44 pupils. If 25% of the pupils spelled all words correctly during the week, how many were perfect in spelling that week?

4. Of the 520 pupils in the upper-grade classes 40% are girls. How many girls are there in these classes?

5. The register of class B was 45 on Feb. 1. If 20% of the pupils were discharged the next day, how many remained?

6. The number of tardy pupils in the Madison School last week amounted to $\frac{1}{2}$% of the register. If the register was 2400, how many were late that week?

7. If 1500 min. a week are allowed for instruction and 20% of this time is used for physical training, what number of minutes is allowed for instruction in physical training?

8. The arithmetic textbook used in the seventh grade cost 50¢; the geography textbook cost 150% as much as this. What was the cost of the geography textbook?

9. If Mrs. Andrews pays 80% of a debt of $500, how much does she still owe?

10. Alice withdrew 60% of her money from the school bank to buy War Stamps. If she had $60 in the bank, how much did she withdraw?

11. The price of certain food costing 20¢ in 1914 was increased 250% in 1920. What was the 1920 price?

12. Lucy's wages were increased 10%. If she was earning $10 a week, how much does she now earn?

13. A certain lot is 100 ft. long and 30% as wide. How wide is it?

14. If a man earning $1200 a year spends 25% of it for rent, what is his annual rent?

15. How many pounds are there in 60% of a ton?

16. Owing to the war, our living expenses increased 60%. If before the war our expenses were $150 a month, how much were they during the war?

17. Mr. Hawkins bought some property worth $25,000. He paid 40% in cash and the rest was mortgaged. How much cash did he pay?

18. Mr. Halligan received $1\frac{1}{4}\%$ of \$4000 for certain work he did. How much was he paid?

19. If 16% of a stock of 200 books were damaged by fire, how many books were damaged?

20. Alice paid \$10 for a summer dress and 550% as much for an evening gown. How much did she pay for the evening gown?

21. What is the difference between $\frac{1}{3}$ of \$300 and $\frac{1}{3}\%$ of \$300?

[With pencil]

1. A man earning \$4500 a year spends 25% of it for rent, 15% of it for clothes, 48% of it for other purposes, and saves the rest. How much does he save?

2. A clothing manufacturer made 85 doz. suits last week and sold 15% of them to Mr. Arnold, 35% of them to Mr. Jameson, and the rest to Mr. Carley. How many suits did he sell to each?

3. Certain property bought years ago for \$6000 is now worth 850% as much. How much is it now worth?

4. A roll of cloth contained $28\frac{3}{4}$ yd. If 40% of it was used for making coats, how much was left?

5. At the end of last term there were 2750 pupils on register in the Harrison School. If 86.4% of them were promoted, how many were promoted?

6. A team won 60% of the 45 games it played. How many games did it win?

7. A team won 85% of the 80 games it played. How many games did it win?

8. Pure air consists of oxygen gas and nitrogen gas. If 79.97% of it is nitrogen, how much nitrogen is there in 1200 cu. ft. of air? how much oxygen?

9. If $1\frac{1}{4}\%$ of the metal in certain ore is pure gold, how much gold is there in 5 tons of this ore?

10. A merchant's profits last year amounted to \$8400. He invested $18\frac{1}{4}\%$ of this amount in cloth at \$2.10 a yard. How many yards did he buy?

11. A man owning 150 acres of land sold $16\frac{1}{2}\%$ of it for \$3712.50. What was the price per acre?

12. Mr. Lowe's annual income is \$5000. In 1918 he invested 16% of it in Liberty bonds and $4\frac{1}{5}\%$ of it in Thrift Stamps. How many dollars' worth of each did he buy?

13. Mrs. Howard's income last year amounted to \$12,000. She invested $48\frac{1}{2}\%$ of this in certain property. How much money did she invest in this property?

14. What is the difference between $\frac{3}{4}\%$ of \$1560 and 75% of \$1560?

15. On Mar. 1, Mr. Wile owed Mr. Jameson \$1720.50. He paid 74% of it on Mar. 10 and 16% of it on Mar. 20. How much was paid each time and how much is still due?

16. A jobber had on hand a quantity of lace amounting to 5600 yd. He sold $37\frac{1}{2}\%$ of it at 42¢ a yard, and the rest at 48¢ a yard. How much did he receive for all?

17. $\frac{1}{2}\%$ of $640+\frac{3}{4}\%$ of $480+.6\%$ of $250=$?

18. $\frac{2}{3}\%$ of $2400+\frac{1}{5}\%$ of $50+.8\%$ of $300=$?

19. On Feb. 1, the number of pupils on register in the Froebel School was 2400. If the register was increased 14.25% in June, what was the new register?

20. If a clerk earns \$1200 a year and saves $16\frac{2}{3}\%$ of it, how long will it take him to save enough to pay for a farm worth \$1700?

Finding what per cent one number is of another.

You have learned that a common fraction may be reduced to a decimal or a per cent by dividing the numerator by the denominator.

Thus, $\frac{3}{8} = 3 \div 8 = .375$, or $37\frac{1}{2}\%$ $8\overline{)3.000}$.375

[Use pencil when needed]

1. Express as per cents: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{3}{5}$, $\frac{4}{5}$.

2. How do you change any common fraction to a decimal? to a per cent?

3. Express as per cents: $\frac{15}{24}$, $\frac{12}{15}$, $\frac{16}{12}$, $\frac{18}{32}$, $\frac{15}{25}$, $\frac{30}{75}$.

Example: 18 is what per cent of 90?

WORK

Since $1 = \frac{1}{90}$ of 90, $18 = \frac{18}{90}$ of 90, or $\frac{1}{5}$ of 90, or .2 of 90, or 20% of 90.

$5\overline{)1.00}$.2 = 20% *Ans.*

Find what part and what per cent:

4. 9 is of 27; of 36; of 72; of 54.
5. 12 is of 24; of 36; of 60; of 72.
6. 4 is of 8; of 6; of 16; of 10.
7. 6 is of 8; of 10; of 15; of 20.
8. 16 is of 8; of 12; of 10; of 4.
9. 24 is of 8; of 12; of 9; of 6.
10. 150 is of 100; of 200; of 300; of 600.
11. 400 is of 100; of 200; of 250; of 600.
12. 300 is of 100; of 150; of 1000; of 250.
13. 180 is of 100; of 120; of 360; of 300.

What per cent of:

	a	*b*	*c*
14.	18 is 8?	2 is 18?	6 is 30?
15.	20 is 15?	30 is 100?	25 is 5?
16.	6 is 18?	100 is 25?	40 is 5?
17.	3 is 12?	12 is 36?	50 is 10?
18.	20 is 30?	32 is 40?	75 is 25?

State what per cent the first number is of the second, and then state what per cent the second number is of the first:

19.	8, 16	6, 15	8, 24
20.	24, 4	40, 50	9, 45
21.	20, 30	16, 18	15, 60
22.	18, 24	250, 150	80, 120
23.	36, 9	18, 54	70, 80

What per cent of:

24.	$\frac{3}{4}$ is $\frac{5}{4}$?	$\frac{5}{12}$ is $\frac{3}{4}$?	$\frac{5}{16}$ is $\frac{1}{4}$?
25.	$\frac{5}{4}$ is $\frac{3}{4}$?	$\frac{5}{6}$ is $\frac{1}{2}$?	$\frac{11}{12}$ is $\frac{2}{3}$?
26.	$\frac{5}{6}$ is $\frac{2}{3}$?	$\frac{1}{2}$ is $\frac{9}{10}$?	$\frac{5}{8}$ is $\frac{5}{16}$?
27.	$\frac{3}{4}$ is $\frac{1}{2}$?	$\frac{7}{8}$ is $\frac{3}{4}$?	$\frac{4}{5}$ is $\frac{3}{4}$?
28.	$\frac{4}{5}$ is $\frac{3}{10}$?	$\frac{4}{9}$ is $\frac{2}{3}$?	$\frac{7}{10}$ is $\frac{3}{20}$?

29. $\frac{8}{9}$ is what per cent of $\frac{2}{3}$?

30. $\frac{3}{5}$ is what per cent of $\frac{9}{10}$?

31. $\frac{1}{4}$ is what per cent of $\frac{7}{8}$?

32. $1\frac{1}{2}$ is what per cent of 2?

33. $2\frac{1}{4}$ is what per cent of 9?

34. $3\frac{1}{3}$ is what per cent of 10?

What per cent of:

	a	*b*
35.	.8 is .2?	.06 is .3?
36.	.24 is .08?	.08 is .2?
37.	.15 is .5?	.5 is 10?
38.	12 is .4?	10 is .3?
39.	.4 is .08?	15 is .5?

What per cent of: [With pencil]

1.	\$160 is \$30?	\$45.50 is \$6.50?
2.	\$60 is \$8?	\$560 is \$50.40?
3.	\$45 is \$60?	\$2$\frac{3}{4}$ is \$.25?
4.	\$36 is \$45?	\$3$\frac{1}{2}$ is \$.75?
5.	\$1200 is \$375?	\$2$\frac{1}{5}$ is \$.80?
6.	\$1.80 is \$.30?	\$2$\frac{7}{10}$ is \$.90?
7.	\$4 is \$1.25?	\$1.75 is \$.50?
8.	3 pt. is 1 qt.?	27 in. is 1 yd.?
9.	1 qt. is 1 pt.?	45 min. is 1 hr.?
10.	6 in. is 1 ft.?	1 hr. is 25 min.?
11.	1 qt. is 1 gal.?	1$\frac{1}{2}$ ft. is 1 yd.?
12.	4 oz. is 1 lb.?	1 yd. is 30 in.?
13.	2 lb. is 8 oz.?	1 ton is 100 lb.?
14.	2 ft. is 1 yd.?	1 lb. is 12 oz.?

15. 1 sq. in. is what per cent of a rectangle 3 in. wide and 4 in. long?

16. The area of a rectangle 2 in. square is what per cent of a rectangle 4 in. square?

17. The cubical contents of a box 2 in. by 3 in. by 4 in. is what per cent of a cubic foot?

18. The cubical contents of a cube 2 in. long is what per cent of the cubical contents of a cube 4 in. long?

Example: If 5 pupils of a class of 40 pupils were rated A in proficiency, what per cent of the class was rated A?

(*a*) WORK

The number of A pupils equals 5 out of 40 or $\frac{5}{40}$ or $\frac{1}{8}$ of all.

$\frac{1}{8} = 12\frac{1}{2}\%$, *Ans.*

(*b*) WORK

EQUATION METHOD

40 pupils = Base 5 pupils = Percentage

$R \times B = P$

Substitute values given: $40R = 5$

$R = \frac{5}{40} = \frac{1}{8}$, or $12\frac{1}{2}\%$, *Ans.*

PROBLEMS [Without pencil]

1. The school basketball team won 18 games of the 20 games it played. What per cent of the games played did it win?

2. In the interclass basketball tournament in Ethel's school the winning team won 9 games and lost 3 games. What per cent of the games played did it win?



3. The basketball team won 12 games of the 15 games it played. What per cent of the games played did it win?

4. In the interclass tournament our class team won 8 games and lost 4 games. What per cent of the games played did it win?

5. There are 18 girls in a class of 45 pupils. What per cent of the class is girls?

6. There were 60 classes in the Washington School. If 40 classes were members of the Junior Red Cross, what per cent of the school belonged to the Junior Red Cross?

7. Of the $360 collected by the Adams School for the Junior Red Cross, $90 was obtained through the sale of articles made by the pupils. What per cent of the receipts was this sum?

8. Our auditorium is 40 ft. wide and 60 ft. long. What per cent of the length is the width? What per cent of the width is the length?

9. The number of seats in this auditorium is 240. At the senior assembly on Friday, there were present 80 eighth-grade pupils, 120 seventh-grade pupils, and 40 sixth-grade pupils. What per cent of all the seats were occupied by the eighth-grade pupils? by the seventh-grade pupils? by the sixth-grade pupils?

10. Of the 150 pupils in the seventh grade of the Eliot School, 90 belonged to the School Athletic Association. What per cent did *not* belong to this association?

11. On Jan. 1, 1600 pupils in the Jefferson School owned Thrift Stamps. If the register of that school was 2400 on that day, what per cent of the school owned Thrift Stamps?

12. Edgar had $18 in the school bank and drew out $4 for Thrift Stamps. What per cent did he withdraw?

13. Mr. Waters owed Mr. Bannard $600. He paid $150 on account. What per cent of the debt did he pay?

14. A manufacturer allowed a discount to all his customers for prompt payment. If a customer's discount on a $60 bill was $3, what per cent discount was he allowed?

15. Edward Morse advertised shirts costing $3 at a reduction of $.50. What per cent reduction was this?

16. A newsboy started out with 60 papers. He sold all but 10 papers. What per cent of his stock did he sell?

17. Mr. Ellison and Mr. Carlson were partners in business. Mr. Ellison contributed $8000, and Mr. Carlson, $4000, to the firm's capital. What per cent of the capital was contributed by each?

18. A man slept 8 hr. per day of 24 hr. What per cent of a full day did he sleep?

19. In a geography test of 20 questions Alice answered 18, Edith, 16, Florence, 15, Stella, 12, and Louise, 14. What per cent of the questions did each answer?

20. An egg candler found that of the 1600 eggs he examined one day, all but 200 were good. What per cent of all were not good?

21. If a ton of iron ore (2240 lb.) produced 1120 lb. of iron, what per cent of the ore was iron?

22. If the school day is 5 hr. long and 1 hr. 15 min. a day are required for Arithmetic, what per cent of the school day is spent in teaching Arithmetic?

23. If 30 min. per day are allowed for recreation, what per cent of the school day is given to recreation?

24. If a man asked $120 for his furniture and accepted $90, what per cent reduction did he allow?

[With pencil]

1. A man earning $4500 a year saves $750 a year. What per cent of his salary does he save?

2. A man's house is worth $25,000 and he insures it for $22,500. For what per cent of its value does he insure the house?

3. In a certain school there are 250 girls and 350 boys. What per cent of the school are girls? boys?

4. The average daily register of the Lincoln School last year was 1800. The average daily attendance was 1720. What was the per cent of attendance for the year?

5. If 170 pupils of the 1800 pupils were not promoted, what per cent of the pupils was promoted?

6. An automobile is priced at $1600 but can be bought through an agent for $1450. What per cent reduction is that?

7. A merchant deducted $9.10 from a bill of $140, as discount. What per cent discount did he give?

8. Mr. Andrews, a manufacturer, allowed a discount of $18.75 from a bill of $250 sent to Mr. Downs. What per cent discount did he allow?

9. My gas bill for September was $3.50; for October it was $3.75. What was the per cent of increase?

10. My electric light bill for May was $2.50; for June it was $2.00. What was the per cent of decrease?

11. A merchant failing in business owed $15,600. He paid his creditors $4680. What per cent of his debts did he pay?

12. What per cent of an acre is a strip of land containing 96 sq. rd.? 120 sq. rd.? 200 sq. rd.?

13. A jobber had 400 yd. of velvet on hand. He sold 96 yd. to a milliner, 220 yd. to a dressmaker, and the rest to a department store. What per cent did he sell to each?

14. A man owned two millinery stores. His yearly purchases for his Boston store amounted to $12,500; for his Albany store, to $7500. (*a*) What per cent of the Boston store's purchases were those of the Albany store? (*b*) What per cent of all his purchases were those of the Boston store? (*c*) What per cent of the Albany store's purchases were the Boston store's purchases?

15. The receipts of the Albany store were \$16,000; those of the Boston store were \$24,000. What per cent of the total receipts were the Boston store's receipts? the Albany store's receipts?

Finding a number when a per cent of it is given.

You have learned that there are 100% in any unit. Thus, there are 100% in a desk, in the number 5, in the base.

Example: If 1% of a number equals 10, what is the number?

WORK

Since 1% of the number = 10, 100% of the number, or the whole number = $100 \times 10 = 1000$, *Ans.* [Without pencil]

1. If 1% of a number equals 8, what is the number?

2. If 1% of a number equals $\frac{1}{2}$, what is the number?

3. If 5% of a number equals 10, how much is 1% of the number? What is the number?

4. If 8% of a number equals 24, how much is 1% of the number? What is the number?

Example: If 6% of a number equals 54, what is the number?

WORK

$.06\,n = 54 \quad n = 54 \div .06 = 900$, *Ans.*

5. If 12% of a number equals 36, what is the number?

6. If 7% of a number equals 14, what is the number?

7. Find the number of which 4% is equal to 16.

8. Find the number of which 20% is equal to 40.

Find the number of which:

	a	*b*
9.	8 is 2%	60 is 12%
10.	9 is 3%	40 is 8%
11.	15 is 5%	30 is 6%

Example: If $\frac{3}{5}$ of a number equals 9, what is the number?

WORK

$$\frac{3}{5}n=9;\quad n=9\div\frac{3}{5}=\overset{3}{\cancel{9}}\times\frac{5}{\underset{1}{\cancel{3}}}=15,\ \textit{Ans.}$$

12. If $\frac{3}{5}$ of a number equals 30, what is the number?
13. If $\frac{2}{5}$ of a number equals 20, what is the number?
14. If $\frac{3}{4}$ of a number equals 9, what is the number?
15. Find the number, $\frac{1}{5}$ of which is equal to 20.
16. Find the number, $\frac{2}{3}$ of which is equal to 40.

NOTE. Change per cents to fractional equivalents, whenever convenient.

Example: If $37\frac{1}{2}\%$ of a number equals 3, what is the number?

WORK

$$37\tfrac{1}{2}\%=\frac{3}{8};\quad \frac{3}{8}n=3;\quad n=3\div\frac{3}{8}=\overset{1}{\cancel{3}}\times\frac{8}{\underset{1}{\cancel{3}}}=8,\ \textit{Ans.}$$

17. If 20% of a number equals 10, what is the number?
18. If $33\frac{1}{3}\%$ of a number equals 5, what is the number?
19. Find the number, 25% of which equals 6.
20. Find the number, $87\frac{1}{2}\%$ of which equals 21.
21. Find the number, $16\frac{2}{3}\%$ of which equals 10.

State the answers quickly:

	a	*b*
22.	60 is 5% of what number?	20 is $12\frac{1}{2}\%$ of what number?
23.	\$75 is 20% of what number?	40 is 25% of what number?
24.	\$30 is $33\frac{1}{3}\%$ of what number?	60 is $37\frac{1}{2}\%$ of what number?
25.	20 is $16\frac{2}{3}\%$ of what number?	20 is $62\frac{1}{2}\%$ of what number?

PROBLEMS [Without pencil]

1. If 8 pupils of the seventh grade or 20% of the whole class bought tickets for the entertainment, how many pupils were there in the class?

2. If 8% of the graduating classes were not graduated, and 16 pupils were not graduated, how many pupils were there in the graduating classes?

3. Our basketball team lost 3 games, which was 10% of all the games played. How many games were played?

4. A man's rent amounts to $600, which is 25% of his yearly salary. What is his salary?

5. If 12% of a man's land is pasture and this equals 24 acres, how many acres does the man own?

6. George drew $6 from the school bank, which was 40% of all the money he had. How much money had he?

7. The seating capacity of our classroom is 50, or 5% of that of our auditorium. What is the seating capacity of our auditorium?

8. 40% of the pupils who took part in the annual entertainment of our school last year were girls. If there were 20 girls in the cast, how many pupils were there in the cast? how many boys?

9. If 75% of the length of a certain board was required for an exercise in our workshop, and the piece required was 6 ft. long, how long was the board from which it was cut?

10. John drew a diagram of a plot to the scale of 5% of the original size. If his diagram was 20 in. long and 15 in. wide, what were the dimensions of the plot? (Express the answer first in inches, then in feet.)

11. A man saves $12\frac{1}{2}\%$ of his salary. If he saves \$300 a year, what is his annual salary?

12. Clara missed 12 words or 20% of all the words of the spelling test. How many words were there in the spelling test?

13. A man was allowed a discount of 10%. If the discount was \$5, what was the amount of the bill?

Example: Find the number, 42% of which equals 210.

WORK

(1) ANALYSIS METHOD

If 42% of the number = \$210

1% of the number = \$210 ÷ 42 = $\frac{\$210}{42}$

100% or the number = $100 \times \frac{\overset{5}{\cancel{\$210}}}{\underset{1}{\cancel{42}}} = \$500$, *Ans.*

(2) EQUATION METHOD

(*a*) $R \times B = P$

Substitute values:

$\frac{42}{100} \times B = \$210$

$B = \$210 \div \frac{42}{100} = \overset{5}{\cancel{\$210}} \times \frac{100}{\underset{1}{\cancel{42}}} = \$500$, *Ans.*

(*b*) $.42 \times B = \$210$

$B = \$210 \div .42$

\$ 5 00, *Ans.*

42.)\$210.00.

210

Find the number: [With pencil]

	a	*b*
1.	4% of which = 604	20% of which = .08
2.	32% of which = 640	35% of which = .7
3.	25% of which = 2140	15% of which = $2\frac{3}{4}$
4.	12% of which = 1194	84% of which = 2100

Find the number: [With pencil]

	a	*b*
5.	$37\frac{1}{2}\%$ of which = 472	105% of which = \$14.70
6.	$62\frac{1}{2}\%$ of which = \$250.25	5% of which = 8 bu. 3 pk.
7.	$2\frac{1}{2}\%$ of which = 2 gal. 2 qt.	36% of which = 9.6 acres
8.	13% of which = 331.5	$\frac{5}{8}\%$ of which = 85
9.	25% of which = 375	150% of which = 75
10.	$\frac{1}{4}\%$ of which = 92	200% of which = 60

11. On April 1, Mr. Frank paid one of his creditors \$720, which was 32% of all he owed him. How much did he owe him?

12. On account of transportation difficulties a hat manufacturer was able to deliver only 45% of his orders one month. If he delivered 387 doz. hats that month, how many dozen had been ordered?

13. A man manages to save \$460 a year, or 8% of his yearly salary. What is his annual salary?

14. The receipts from advertisements in the last number of our school paper amounted to \$36.60, or 30% of the total receipts. How much money did this number of the paper yield?

15. If 95% of the graduating classes received diplomas and 209 diplomas were distributed, how many pupils were there in the graduating classes?

16. A bankrupt (one who failed in business) paid his creditor 34% of the money due him. If the creditor received \$646, how much was the entire debt?

17. The number of children in the kindergarten classes of the Hale School is 120, or $7\frac{1}{2}\%$ of the total register of the school. What is the register of the school?

18. Lawrence weighs 117 lb., or 75% as much as his father. How much does his father weigh?

19. Last June 2436 pupils in the Hamilton School were promoted. If 87% of the school were promoted, how many pupils were there in the school?

20. If 84 pupils, or $3\frac{1}{2}\%$ of the register of a school, were absent on Friday, how many pupils were there on register that day?

21. If $5\frac{1}{2}\%$ of the money invested is paid as interest, how much money must be invested to pay a yearly interest of $1100?

22. Certain iron ore yields 42% pure iron. How many pounds of iron ore will yield 1680 lb. of pure iron?

23. A man left all his money to his three children. The oldest received $6000, or 40% of all; the youngest received 25%; and the second child received the rest. How much did each one receive?

24. Farmer Till used 20.3 acres or 14% of his farm for raising potatoes. How large was his farm?

25. The width of a rectangular field is 250 ft., or $31\frac{1}{4}\%$ of the length. How long is it?

26. A merchant was allowed a discount of 5%. If he deducted $14.50 from the bill, how large was the bill?

Finding a number when a certain per cent more or less than the required number is given. Or, *Finding the base when the amount or difference and the rate of increase or decrease are given.*

1. How many per cent are there in a unit? in any number?

2. How many per cent of a number is the number plus 10% of itself?

3. How many per cent of a number is the number increased by 15% of itself?

4. How many per cent of a number is the number increased by 25% of itself?

Example 1: What number increased by 25% of itself equals 165?

WORK

(1) ANALYSIS METHOD

(*a*) The number required = 100% of number
Number + 25% of number = 165
100% of number + 25% of number = 165
125% of number = 165
1% of number = $165 \div 125 = \frac{165}{125}$
100% of number or number = $100 \times \frac{165}{125} = 132$, *Ans.*

(*b*) $\frac{5}{4}$ of number = 165
$\frac{1}{4}$ of number = $165 \div 5 = 33$
$\frac{4}{4}$ of number or number = $4 \times 33 = 132$, *Ans.*

(2) EQUATION METHOD

(*a*) Let n = number
$n + \frac{1}{4}n = 165$
$\frac{5}{4}n = 165$
$n = 165 \times \frac{4}{5} = 132$, *Ans.*

(*b*) $n + .25n = 165$
$1.25n = 165$
$n = 165 \div 1.25 = 132$, *Ans.*

Example 2: What number decreased by 25% of itself equals 240?

WORK

(1) ANALYSIS METHOD

(*a*) Number − 25% of number = 240
100% of number − 25% of number = 240
75% of number = 240
1% of number = $240 \div 75 = \frac{240}{75}$
100% of number or number = $100 \times \frac{240}{75} = 320$, *Ans.*

(*b*) $\frac{3}{4}$ of number = 240
$\frac{1}{4}$ of number = $240 \div 3 = 80$
$\frac{4}{4}$ of number or number = $4 \times 80 = 320$, *Ans.*

(2) EQUATION METHOD

(*a*) Let n = number

$n - \frac{1}{4}n = 240$

$\frac{3}{4}n = 240$

$n = 240 \times \frac{4}{3} = 320$, *Ans.*

(*b*) $n - .25n = 240$

$.75n = 240$

$n = 240 \div .75 = 320$, *Ans.*

PROBLEMS [Without pencil]

Tell whether the number required in problems 1 to 4 is larger or smaller than the number mentioned:

1. What number increased by 10% of itself equals 55?
2. What number decreased by 40% of itself is equal to 30?
3. 65 is 30% more than what number?
4. After selling 20% of his stock a peddler had 80 oranges. How many had he at first?
5. What number increased by 25% of itself equals 15?
6. What number decreased by 50% of itself equals 30?
7. What number increased by 20% of itself equals 30?
8. What number decreased by $33\frac{1}{3}$% of itself equals 40?
9. What number increased by 40% of itself equals 35?

Find the number which when:

10. Increased by $12\frac{1}{2}$% of itself equals 18.
11. Decreased by 60% of itself equals 80.
12. Decreased by 75% of itself equals 10.
13. Increased by 100% of itself equals 12.
14. Increased by 200% of itself equals 30.
15. There are 40 pupils in Fred's class. This is $33\frac{1}{3}$% more than the number in Ellen's class. How many pupils are there in Ellen's class?

16. 100 pupils were absent from school on Monday. This was $\frac{1}{4}$ more than the number absent on Friday. How many were absent on Friday?

17. Our school register of 2400 pupils is 20% larger than that of the Audubon School. What is the register of the Audubon School?

18. John's wages were increased 25%. He now receives $25 per week. How much did he earn per week before the increase?

19. A newsboy's receipts last week were $12. This was $33\frac{1}{3}\%$ more than the previous week's receipts. What were the receipts of the previous week?

20. The price of butter was increased 50% during the war. If after the increase butter cost 75¢ a pound, how much did it cost before the increase?

21. Find the number which when decreased by $12\frac{1}{2}\%$ of itself equals 28.

22. Mr. Dolan's new automobile cost $1200, or 20% more than his last year's car. How much did his car cost last year?

23. After spending 25% of my money, I had $30 left. How much had I at first?

24. If 40% of Edith's class bought tickets for the entertainment, and 30 pupils did not buy tickets, how many pupils were there in the class?

25. Only 10% of our class did not join the Athletic Association. If 36 pupils of our class belong, how many pupils are there in our class?

26. A man bought a house in the suburbs. He paid 60% of the purchase price in cash and gave a mortgage for the rest, which was $4000. How much did the house cost?

☞ *Avoid mistakes by reading the example very carefully, by noting what is required and what is given, and by checking all work.*

[With pencil]

1. 189 is 35% more than what number?

2. What number decreased by 14% of itself is equal to 645?

3. What number increased by 32% of itself is equal to 1089?

4. What number diminished by 26% of itself equals 703?

5. What number increased by 35% of itself equals 432?

6. Find the number which when increased by 150% of itself equals $2050.

7. Find the number which equals 1950 when increased by 225% of itself.

8. What number diminished by 31% of itself is equal to $5.52?

9. Mr. Lowe paid his creditor $1384.60 after deducting 8%. What was the amount of the bill?

10. The dimensions of our gymnasium are 20 ft. by 30 ft. The area of the floor is 20% larger than that of our classroom. What is the area of the classroom?

11. Mrs. Simpson went shopping one day. She spent 45% of the money she had in her purse. If she had $11 left, how much had she at first?

12. Find the number which when increased by 6% of itself equals 2650.

13. At a certain sale, trimmed hats were reduced 25% in price. If a certain hat was sold for $12, what was the original price?

14. The school bank had 504 depositors last year. This was an increase of 12% over the previous year. How many depositors were there the previous year?

15. A manufacturer of clothing made 2135 garments this month. This was an increase of 6.75% over last month's output. How many garments were manufactured last month?

16. My gas bill this month was \$2.72, which is 15% less than last month's bill. How much was last month's gas bill?

17. In preparing his income tax report for 1920, a man discovered that his profits were 12% less than the previous year's. If his profits in 1920 were \$2200, how much were they in 1919?

18. The price of quinine in 1920 was 49¢ an ounce, wholesale. This was an increase of 250% over the price in 1914. What was the 1914 price?

Review Exercises

[With pencil]

Find the missing terms:

	Base	Rate	Percentage	Amount	Difference
1.	\$1280.00	?	\$ 44.80	—	—
2.	?	35%	\$556.50	—	—
3.	\$ 165.00	112%	—	?	—
4.	?	8% increase	—	\$265.68	—
5.	\$1560.00	?	—	—	\$1497.60
6.	\$7400.00	$\frac{1}{8}$%	?	—	—
7.	\$ 350.00	?	\$ 10.50	—	—
8.	?	$\frac{1}{2}$%	\$ 68.00	—	—
9.	?	220%	\$184.80	—	—
10.	\$ 164.80	2.6%	?	—	—

TRADE OR COMMERCIAL DISCOUNT

When something is sold for less than the price stated on the bill or on the price list, we say it is sold at a *discount* or a reduction in price.

Discount is a deduction made from a debt, price, or bill. As discounts are usually made to tradespeople, we call them **trade** or **commercial discounts.**

Wholesalers and manufacturers grant discounts for immediate or cash payments, for payment before or when the bill is due, for large purchases, and because of frequent changes in the market price. They usually publish a list price and then allow a discount " to the trade" (to customers).



Discounts are usually expressed in per cents or fractions.

Goods listed in the catalogue not subject to discount are marked " *Net.*"

The discount allowed by a wholesaler is usually written on the bill after the printed word " *Terms.*"

Thus, " Terms — 5%, 30 days " means that the purchaser is allowed a discount of 5% if the bill is paid in 30 days. " Terms — 7/10 " means that a discount of 7% is

allowed if the bill is paid in 10 days. "Terms — 60 days, *net*" means that the purchaser is allowed 60 days in which to pay his bill, but is not allowed any discount.

Successive Discounts. — Sometimes more than one discount is allowed. Instead of changing catalogues frequently, dealers change the discounts. If the market price falls, the discount is increased; if it rises, the discount is decreased. The discount is usually increased by an additional discount. Thus, discounts of 20%, 10%, and 5% may be allowed, or 20, 10, 5. This means that 20% is deducted from the list price, 10% from the remainder, and 5% from the second remainder.

The sum to be paid after the discount has been taken off is called the **net price** or the **net amount.**

Problems in discounts are percentage problems in which:

The **base** is the **list price** or **catalogue price.**

The **rate** is the **per cent of discount.**

The **percentage** is the **discount.**

The **difference** is the **net price.**

[Without pencil]

1. What is meant by "discount"?

2. What is meant by "terms — 2/10"? by "terms — 5/30"?

3. In commercial or trade discount examples, what name is given to the base? to the percentage? to the rate? to the difference?

4. How do you find the discount when you know the list price and the rate? How do you find the net price?

5. Find the discount on $250 worth of merchandise at 5%.

6. Which is cheaper, a chair for $9 or one for $10 less a discount of 20%?

Find the discount and the net price:

	a		*b*	
	List Price	Rate of Discount	List Price	Rate of Discount
7.	$ 100	5%	$ 160	12½%
8.	$ 200	6%	$ 300	7%
9.	$1000	2%	$ 600	5%
10.	$ 400	10%	$1200	20%
11.	$ 450	⅓%	$ 720	37½%

Example: Find the net price or cost when the list price is $785 and the discount is 6%.

(*a*) Work

$R \times B = P$

$.06 \times \$785 = \$47.10$, discount

$\$785 - \$47.10 = \$737.90$, net price, *Ans.*

(*b*) Work

List price = 100% of list price

Net price = 100% of list price − 6% of list price = 94% of list price

$.94 \times \$785 = \$737.90$, net cost, *Ans.*

$$\begin{array}{r} \$785 \\ .94 \\ \hline 3140 \\ 7065 \\ \hline \$737.90 \end{array}$$

☞ *In finding discounts, drop ½¢ or less and add another cent for every fractional part equal to ½¢ or more.*

[With pencil]

Find the discount and net price of the following bills:

	a	*b*
1.	$465, 2% off	$152.10, 7½% off
2.	$750, 7% off	$312.40, 2½% off
3.	$842, 5% off	$750.12, 8% off
4.	$350.75, 6% off	$725.50, 3% off
5.	$140.50, 8% off	$10.75, 6% off
6.	$312.50, 5% off	$122.75, 5½% off
7.	$62.75, 6% off	$180.60, 8% off

Example: The list price of an automobile is \$2250; discounts of 10% and 5% are allowed. Find the net cost.

WORK

(1) LONG WAY

$R \times B = P$

$\frac{1}{10} \times \$2250 = \$225$, discount at 10%

$\$2250 - \$225 = \$2025$, price after deduction of first discount

$.05 \times \$2025 = \$101.25$, discount at 5%

$\$2025 - \$101.25 = \$1923.75$, net cost, *Ans.*

(2) SHORT WAY

(*a*) $\frac{9}{10} \times \frac{19}{20} \times \$2250 = \$1923.75$, net cost, *Ans.*

(*b*) $.9 \times .95 = .855$

$.855 \times \$2250 = \$1923.75$, net cost, *Ans.*

Find the net cost: [Use pencil when needed]

	LIST PRICE	RATES OF DISCOUNT
8.	\$700	20%, 10%
9.	\$600	10%, 10%
10.	\$500	60%, 10%
11.	\$2400	$12\frac{1}{2}$%, 10%
12.	\$1600	25, 15, 10
13.	\$3200	10, 10, 5
14.	\$6400	10%, 10%
15.	\$1500	$33\frac{1}{3}$%, 25%
16.	\$775	20%, 5%
17.	\$235	50%, 10%
18.	\$2600	25%, 2%
19.	\$204	$12\frac{1}{2}$%, 10%
20.	\$876	$33\frac{1}{3}$%, 5%
21.	\$2100	30%, 10%, 10%
22.	\$1500	20%, 10%, 50%

Find the net cost:

	List Price	Rates of Discount
23.	$1000	10%, 5%, 2%
24.	$2000	20%, 10%, 5%
25.	$8000	12½%, 10%
26.	$4000	25%, 20%, 10%
27.	$6000	30%, 10%, 5%

To find the single discount equal to several successive discounts.

Example: What single discount is equal to two successive discounts of 20% and 10%?

Work

(1) Long Way

List price = 100% of list price
Less 20% = 20% of list price
Remainder = 80% of list price
Less 10% = 8% of list price
Net price = 72% of list price
100% − 72% = 28%, *Ans.*

(2) Short Way

(*a*) $\frac{4}{5} \times \frac{9}{10} \times 100\% = 72\%$, net cost
100% − 72% = 28%, *Ans.*

(*b*) $.8 \times .9 = .72 = 72\%$, net cost
100% − 72% = 28%, *Ans.*

[With pencil]

Find the single discount that is equal to discounts of:

1. 40% and 10%
2. 25% and 25%
3. 50% and 10%
4. 25% and 20%
5. 60% and 20%
6. 30% and 20%
7. 12½% and 12½%
8. 20% and 20%
9. 10% and 10%
10. 30% and 30%
11. 15% and 10%
12. 10% and 2%
13. 20% and 5%
14. 12% and 6%
15. 33⅓% and 10%
16. 16⅔% and 20%
17. 40% and 15%
18. 30% and 25%
19. 50% and 50%
20. 60% and 33⅓%

To find the rate of discount.

Finding the rate of discount is the same as finding what per cent the discount is of the list price.

Find the rate of discount:

	List Price	Discount	Net Price
1.	$ 500	$ 5	—
2.	$ 200	$10	—
3.	$1200	$60	—
4.	$ 300	—	$ 270
5.	$ 800	—	$ 720
6.	$ 600	—	$ 570
7.	$1000	—	$ 980
8.	$2000	—	$1940
9.	$1600	$80	—
10.	$ 320	$40	—
11.	$ 800	—	$ 640

PROBLEMS [With pencil]

☞ *Be careful to note what is given and what is required. Check all work.*

1. Mr. Newton bought a bill of goods amounting to $750.60 and was allowed a discount of 7% for prompt payment. How much did he save by paying at once?

2. An automobile listed at $3500 was sold at a discount of 12%. How much was received for it?

3. Mr. J. Frank sold goods on terms of 7/10 or 5/30. How much did he receive for the following bills?

a. $82.50 paid in 8 days
b. $64.92 paid in 10 days
c. $145.75 paid in 20 days

4. What is the net price of a bill of $345.60 on which a discount of $7\frac{1}{2}\%$ is allowed?

5. Students are allowed a discount of 15% on all books published by D. R. Gray and Company. How much must a student pay for 2 histories priced at $.60 each, a dictionary priced at $14.50, and an encyclopedia priced at $64.50?

6. A certain store advertises a sale of all furniture at a reduction of 15%. Find the sale price of chairs marked $16.50, $24.50, $36, $12.60, and $30.

7. Mr. Harlan buys $460 worth of cotton goods and is allowed a discount of 7% for cash payment or 5% if paid within 30 days. He pays cash. How much does he pay? How much does he save?

8. On furniture listed at $180, discounts of 20% and 20% are allowed. How much must the purchaser pay?

9. Mrs. A. Fallon has a charge account at Arthur Smith and Company. She is allowed a discount of 6% on all purchases. How much must she pay for the following purchases made last month?

Petticoat,	$ 8.75	Fur Collar,	$32.75
Shoes,	$12.50	Shirtwaists,	$12.40

10. If 620 yd. of cloth listed at $2.60 a yard are damaged by water and sold at a discount of 25%, how much is received for the cloth?

11. What is the net cost of 160 yd. of lace at $62\frac{1}{2}¢$ a yard, on which discounts of 10% and 5% are allowed?

12. How much is due on a bill of hardware amounting to $400, the discounts being 25% and 10%?

13. Albert Lambert buys 120 doz. knives from the A. B. Cutler Company at $8 a dozen, less 20%, and 10% off for cash. How much does he pay?

14. A merchant can buy goods listed at \$4000 at a single discount of 25% or at discounts of 20% and 5%. Which is better for him, and by how much?

15. Which is better for the buyer, and by how much, a discount of 50% on a bill of goods amounting to \$850, or discounts of 25%, 15%, and 10%?

16. I can buy a machine for \$120 less 20% and 10% from one company, or for \$130 less 25% and 10% from another company. Which offer should I accept, and why?

17. How much less is the net cost of 250 yd. of braid, listed at 40¢ a yard, when the discount is 20%, than when it is 10% and 10%?

18. Certain electrical supplies are sold at discounts of 25% and 5% for cash. How much must be paid on a bill for \$600 worth of such supplies?

19. A lot of books are sold on terms of 10% and 5%. Find the net cost of a bill amounting to \$140.50.

20. Find the net cost of:

2 doz. hammers @ \$ 4.50
1½ doz. saws @ \$18

Terms 15% and 5%.

21. What single discount is equal to the successive discounts 25% and 10%?

22. A jeweler buys a necklace listed at \$450 less 20% and 20% and sells it at the list price. How much does he gain?

23. Mr. Vincent receives a discount of \$48 from a bill of goods listed at \$960. What is the rate of discount?

24. A. C. Lane and Company pay \$150 to settle a bill of \$160. What per cent discount is allowed?

PROFIT AND LOSS

Percentage is constantly applied to business transactions. Problems in profit and loss are percentage problems in which:

The **base** is the **cost** or **money invested.**

The **rate** is the **per cent of profit (gain)** or **of loss.**

The **percentage** is the **profit** or **loss.**

The **amount** or the **difference** is the **selling price.**

The price paid for goods is called the **cost**; the price at which goods are sold is called the **selling price.**

The difference between the total receipts and the total expenses is called the **net profit.**

[Without pencil]

1. What is meant by selling at an advance?

2. When goods are sold at a loss, which is greater, the selling price or the cost?

3. When goods are sold at a profit, which is greater, the selling price or the cost?

4. What are the terms used in profit and loss problems?

5. Give the term corresponding to the percentage; the base; the difference; the amount; the rate.

To find the profit or the loss and the selling price.

Example: A desk costing \$80 was sold at a profit of 20%. What was the profit? the selling price?

WORK

$$\left.\begin{array}{l} R \times B = P \\ \frac{1}{5} \times \$80 = \$16, \text{ profit} \\ \$80 + \$16 = \$96, \text{ selling price} \end{array}\right\} \textit{Ans.}$$

Find the missing terms: [Without pencil]

	Cost	Rate of Profit	Rate of Loss	Profit in Dollars	Loss in Dollars	Selling Price
6.	$ 600	10%	—	?	—	?
7.	$ 900	—	33⅓%	—	?	?
8.	$1200	25%	—	?	—	?
9.	$ 500	20%	—	?	—	?
10.	$ 200	—	20%	—	?	?
11.	$ 60	—	50%	—	?	?
12.	$ 80	12½%	—	?	—	?
13.	$ 700	30%	—	?	—	?
14.	$ 250	—	40%	—	?	?
15.	$ 320	—	25%	—	?	?

Find the profit or the loss and the selling price: [With pencil]

	a			*b*		
	Cost	Rate of Profit	Rate of Loss	Cost	Rate of Profit	Rate of Loss
1.	$ 170	125%	—	$ 75	320%	—
2.	$ 84	—	38%	$ 80	—	75%
3.	$ 320	160%	—	$4560	24½%	—
4.	$ 72	⅛%	—	$8250	—	12⅕%
5.	$ 150	—	⅗%	$6420	—	16½%
6.	$ 275	1⅗%	—	$8410	32%	—
7.	$ 450	—	2⅔%	$6318	15½%	—
8.	$ 475	250%	—	$2412	—	22¼%
9.	$ 500	150%	—	$3080	—	5½%
10.	$1200	—	5%	$6250	22½%	—

PROBLEMS [Without pencil]

1. Shoes costing \$6 a pair were sold at a profit of 50%. Find the profit and the selling price.

2. A profit of 25% was made in selling a hat costing \$4. What was the selling price?

3. How much was gained by selling caps costing 50¢ each at an advance of 100%?

4. When goods costing \$80 were sold at a loss of 10%, what was the selling price?

5. A storekeeper sold all of last season's stock, costing \$120, at a loss of $33\frac{1}{3}\%$. What was the selling price?

6. Cloth, slightly shopworn, was sold at a loss of $16\frac{2}{3}\%$. If the cloth cost \$1.20 a yard, for how much was it sold?

7. How much did Mr. Lewis receive for his car which cost him \$1200 and which he sold after a year's use at a loss of 25%?

8. How much did a man get for a farm costing him \$2000 when he sold it at a loss of 5%?

9. At what price must hats costing \$1.50 each be sold to gain 150%? to gain 100%? to gain 50%?

10. If a profit of $12\frac{1}{2}\%$ was made in selling cloth costing \$2.40 a yard, what was the selling price per yard?

11. A phonograph bought for \$65 was later sold at a loss of 10%. What was the loss? the selling price?

12. A retailer bought 60 yd. of ribbon at 10¢ a yard and sold it at an advance of 20%. What was the selling price per yard? the selling price of all?

13. Pins bought at 5¢ a paper were sold at a profit of 200%. Find the selling price per paper.

14. Hats bought at auction at \$2 each were sold at a profit of 150%. What was the gain?

15. A jeweler sold rings at a profit of 120%. How much did he receive for a ring that cost him $50?

16. A manufacturer of hats found that it costs him $11 to make a dozen hats of a certain kind. For how much must he sell them to make a profit of 150%?

[With pencil]

☞ *Drop less than $\frac{1}{2}$¢ and add another cent for every fractional part equal to $\frac{1}{2}$¢ or more.*

1. A house costing $32,000 was sold at a profit of $8\frac{1}{2}$%. What was the selling price?

2. Ornaments costing $7.75 a dozen were sold at an advance of 140%. What was the selling price per dozen?

3. If 8 bolts of cloth, each containing $21\frac{1}{2}$ yd. and costing $2 a yard, were slightly damaged and were sold at a loss of 12%, what was the selling price of all?

4. A clothing manufacturer sold $8\frac{3}{4}$ doz. suits, costing $20 each, at a profit of 40%. What was the selling price per suit? the selling price of all? the gain on all?

5. A manufacturer sold shirts at a profit of 75%. How much did he receive for $4\frac{1}{2}$ doz. shirts costing $10.50 per dozen and $\frac{3}{4}$ doz. shirts costing $16 per dozen?

6. If beans cost $16\frac{1}{2}$¢ a pound wholesale, how much did a grocer receive for 200 lb. sold at a profit of 15%?

7. If potatoes were bought at $2 a bushel and sold at a profit of 76%, how much was received for each quart?

8. During the World War knitting yarn was in great demand. A certain dealer paid 40¢ a hank for a quantity of yarn before the war and sold it at a profit of 160% during the war. How much did he receive for 150 hanks?

9. At the end of the year a clothing manufacturer found he had 162 yd. of cloth which he no longer could use. It had cost him, on the average, \$2.40 a yard. He sold all at a reduction of $8\frac{1}{4}\%$. What was his loss?

10. A manufacturer bought hats at \$8.50 per dozen and trimmed them with material costing \$4.50 for a dozen hats. At what price per dozen must he sell the hats to realize a profit of 75%?

11. He bought another lot at \$7.20 a dozen and trimmed them at a cost of 40¢ each. At what price per dozen must he sell them to realize a profit of 125%?

12. If it required $3\frac{3}{8}$ yd. of cloth to make a man's suit and the cloth cost \$2.40 a yard, labor and other materials averaging \$11.90 a suit, for how much must each suit be sold to gain 60%?

13. A grocer bought a bag of potatoes for \$5.85 and paid \$.75 expressage. If he made a profit of 75% of his total cost, for how much did he sell the bag of potatoes?

14. A dealer bought 8 bags of onions, 100 lb. each, at 2¢ a pound. He lost 10% of them through freezing and careless handling. If he made a profit of 35% on his investment, for how much did he sell each pound of the remainder?

15. A dealer bought ornaments at \$16 per dozen less 10%, and sold them at a profit of 125% of the net cost. What was his selling price?

16. A department store bought pianos listed at \$800 at discounts of 10 and 10, and sold at an advance of 25% of the net cost. How much was received for each piano?

17. A milliner bought hats at \$36 a dozen less 10%, and sold them so as to gain 100% on her investment. What was the selling price of each hat?

18. M. H. Balter and Company bought lamps listed at \$24 per dozen, less 20 and 10, and sold them at a profit of 60% on the net cost. What was the selling price of each lamp?

To find the per cent of profit or loss.

☞ Some business men reckon the per cent of profit or loss on the cost, while others reckon it on the selling price. In solving the problems in this book, reckon the per cent of profit or loss on the cost, unless otherwise directed.

Example: An automobile costing \$1500 was sold for \$950. Find the loss per cent.

(*a*) WORK

$R \times C = L$

$R \times \$1500 = \$550$

$R = \frac{550}{1500} = \frac{11}{30} = 36\frac{2}{3}\%$, *Ans.*

\$1500, cost

\$ 950, selling price

\$ 550, loss

$30)\overline{11.00}\ .36\frac{2}{3}$

(*b*) WORK

As the loss is reckoned on the cost, \$550 is lost on every \$1500 invested; $\frac{550}{1500}$ or $\frac{11}{30}$ of the cost is lost.

Cost = 100%

$\frac{11}{30}$ of 100% = $36\frac{2}{3}\%$, *Ans.*

Find the per cent of profit or of loss: [Without pencil]

	COST	PROFIT	LOSS
1.	\$ 12	\$ 6	—
2.	\$ 30	—	\$ 5
3.	\$ 40	\$10	—
4.	\$160	—	\$20
5.	\$ 4	—	\$ 3
6.	\$ 4	\$ 8	—
7.	\$ 12	\$15	—
8.	\$ 20	\$45	—
9.	\$.50	\$ 2	—
10.	\$ $\frac{3}{4}$	—	\$ $\frac{1}{4}$

Find the profit or loss per cent:

	a		*b*		
	Cost	Selling Price	Selling Price	Profit	Loss
11.	$ 80	$60	$30	$15	—
12.	$ 30	$50	$20	$ 5	—
13.	$100	$60	$60	$20	—
14.	$ 2	$.50	$.50	$.40	—
15.	$ 4	$ 1	$60	—	$10
16.	$ 8	$ 9	$35	—	$15
17.	$ 10	$40	$.60	—	$.15
18.	$ 80	$50	$ 1.50	—	$.50

Find the per cent of profit or loss: [With pencil]

	Cost	Profit	Loss	Selling Price
1.	$ 90	—	—	$76
2.	$ 7.20	$.90	—	—
3.	$450	$ 37.50	—	—
4.	$149	—	$ 7.45	—
5.	$ 27	—	—	$ 33.75
6.	$ 4.50	—	—	$ 3.60
7.	$ 17.40	—	—	$ 20.88
8.	$.80	—	—	$ 1.25
9.	$ 54	—	—	$ 67.50
10.	$125	—	—	$118.75
11.	$500	$200	—	—
12.	$250	—	$100	—
13.	$700	$300	—	—
14.	$850	—	$125	—

Find the rate of profit or loss in the following:

	Cost	Profit	Loss	Selling Price	Rate of Profit	Rate of Loss
15.	$ 8.65	—	—	$20.76	?	—
16.	—	—	$.60	$19.40	—	?
17.	—	$.55	—	$ 4.40	?	—
18.	$23.50	—	—	$20.68	—	?
19.	$.80	—	—	$ 1.70	?	—
20.	—	—	$.75	$ 2.75	—	?
21.	—	$.45	—	$ 2.25	?	—
22.	$.65	—	—	$ 2.73	?	—
23.	—	—	$4.96	$57.04	—	?

PROBLEMS [Without pencil]

☞ *Do not forget that the profit or loss is reckoned on the cost.*

1. A newsboy made a profit of 2¢ in selling papers that cost him 6¢. What per cent did he gain?

2. A dealer made a profit of $2 in selling a coat that cost him $10. What per cent did he gain?

3. He sold another coat for $10 and made a profit of $2. What per cent did he gain?

4. If $6 was gained in selling a desk costing $24, what per cent was gained?

5. If $6 was gained by selling furniture for $24, what per cent was gained?

6. Mr. Manton bought an automobile for $3000 and later sold it at a loss of $500. What per cent did he lose?

7. Mr. Ellis sold his automobile for $3000, thereby losing $1000. What per cent did he lose?

8. Slightly damaged goods costing \$1.60 a yard were sold at a loss of \$.80 on every yard. What was the loss per cent?

9. By selling hats at a sacrifice sale at \$3 each, Mr. Burton lost \$1 on every hat. What was his loss per cent?

10. Louise bought a bag for 25¢ and sold it to a classmate for 20¢. What per cent did she lose?

11. Edith bought some stationery at a bazaar for 30¢ and sold it to her friend for 25¢. What per cent did she lose?

12. Our Junior Red Cross Club invested \$.60 in candy and sold it for \$1.20. What was the per cent of profit?

13. A newsboy bought 20¢ worth of newspapers and his sales amounted to 18¢. What was his per cent of loss?

14. A peddler bought a job lot of underwear for \$16 and sold it for \$48. What per cent did he make?

15. A piano costing \$400 was sold for \$100 at auction. What was the loss per cent?

16. A peddler bought bananas at 20¢ a dozen and sold them at 3¢ each. What per cent did he make?

17. Andrew sold his golf club for \$3 and gained \$.50. What per cent did he gain?

18. Walter sold his golf club for \$2 and lost \$.50. What per cent did he lose?

19. Constance sold a pair of shoes that were too small for her for \$6, and thereby lost \$3. What per cent did she lose?

20. Theodore lost \$6 by selling his bicycle for \$24. What per cent did he lose?

21. At a sale a chair was sold for \$16 at a loss of \$4. What per cent was lost?

22. What per cent was gained on lace sold for 50¢ at a gain of 30¢?

[With pencil]

1. A contractor charged \$2100 for a certain job; it cost him \$1600. What per cent did he gain?

2. It cost a manufacturer \$11.60 to make a dozen hats. He sold them at \$18.85 a dozen. Find his per cent of profit.

3. A milliner bought hats at \$20 per dozen and sold them at \$3 each. What per cent did she make?

4. Potatoes bought at \$2.50 per bushel were sold at \$.10 a quart. What per cent was gained?

5. An automobile was sold for \$1250 at a loss of \$250. What per cent was lost?

6. A manufacturer sold certain remnants for \$59.50 at a loss of \$10.50. What per cent did he lose?

7. A peddler paid \$3.50 for 300 fancy post cards and sold them at the rate of \$.25 a dozen. What per cent did he gain?

8. Sugar bought at $6\frac{1}{2}$¢ a pound was sold at 8¢ a pound. What was the per cent of profit?

9. A grocer bought flour at \$10 a barrel (196 lb.) and sold it in 7-pound packages at \$.55 a package. What per cent did he gain?

10. Epsom salts bought at $1\frac{3}{4}$¢ a pound before the World War were sold by a wholesale druggist during the war at the market price of $3\frac{3}{4}$¢ a pound. What per cent of profit did he make?

11. A farmer paid \$3000 for a farm and farmhouse. He spent \$100 on repairs and \$400 for improvements and then sold all for \$4500. What per cent did he gain?

12. Amelia sold her spring hat, which she did not like, for \$$3\frac{1}{4}$ and thereby lost \$.75. What per cent did she lose?

13. By selling a necklace for \$800, a jeweler gained \$450. What per cent did he gain?

14. At a certain auction sale, vases were sold for \$5.50 each, at a loss of \$6½. What was the loss per cent?

15. Neckties bought at \$4.50 a dozen were sold at \$.50 each. What was the per cent of profit?

16. A certain concern selling goods at a sacrifice lost \$.75 on every shirt sold for \$2.50. What per cent was lost?

To find the cost when the profit and the per cent of profit or the loss and the per cent of loss are given.

Example: By selling a quantity of velvet at a profit of \$150 a dealer gained 30%. Find the cost and the selling price.

(a) WORK

Since 30% of the cost is gained, and \$150 is gained,
30% of C = \$150
or $\frac{3}{10}\ C$ = \$150
C = \$150 ÷ $\frac{3}{10}$ = \$500
S. P. = \$500 + \$150 = \$650 } *Ans.*

(b) WORK

$R \times B = P$
Or, $R \times C = G$
$\frac{3}{10} \times C$ = \$150
C = \$150 ÷ $\frac{3}{10}$
= \$500
S. P. = \$500 + \$150 = \$650 } *Ans.*

☞ *Be careful to avoid mistakes by noting what is required and what is given, and by checking all work.*

Find the cost and the selling price: [Use pencil when needed]

	a			*b*		
	PROFIT	LOSS	RATE	PROFIT	LOSS	RATE
1.	\$60	—	50%	\$50	—	62½%
2.	—	\$20	10%	\$80	—	200%
3.	\$40	—	20%	—	\$ 30	83⅓%
4.	\$10	—	25%	—	\$ 75	60%
5.	—	\$30	12½%	—	\$120	37½%
6.	—	\$50	33⅓%	\$60	—	300%
7.	\$16	—	50%	\$35	—	62½%

Find the cost and the selling price:

	a			*b*		
	PROFIT	LOSS	RATE	PROFIT	LOSS	RATE
8.	$300	—	75%	$294	—	14%
9.	$ 40	—	½%	—	$2.17	3½%
10.	—	$462	22%	$ 34.85	—	4¼%
11.	$984	—	3%	$ 5.92	—	64%
12.	—	$175	70%	—	$5.51	38%
13.	$420	—	150%	$ 16.50	—	132%
14.	—	$ 32.40	8%	$ 18.45	—	225%
15.	$ 48.40	—	¼%	—	$2.07	36%

PROBLEMS [Without pencil]

1. If a merchant sold goods at a profit of 10% and gained $30, what was the cost of the goods?

2. A grocer sold tea at 5¢ a pound less than the cost and lost 12½%. What was the cost of the tea?

3. A hardware dealer made a profit of 30¢, or 40% of the cost of certain hammers. Find the cost and the selling price of these hammers.

4. A clothing manufacturer sold goods at a gain of 50%. If his profit on one sale was $100, what was the cost of the goods sold? the selling price?

5. By selling goods at a sacrifice Mr. Lowe lost $40, which was 25% of the cost of his goods. What was the cost? the selling price?

6. A grocer gained 6¢ on every pound of coffee he sold. If his profit was 25% of the cost, how much did he pay for each pound, and how much did he receive for each pound?

7. A bookcase was sold at a loss of 20% of the cost. If the loss was $12, how much did the bookcase cost? How much was received for it?

8. By selling hats at $1.50 each above the cost, a milliner gained 50%. How much did each hat cost?

9. Mr. Alexander made $1.20 on every sweater he sold for 60% more than it cost him. How much did each sweater cost him?

10. At a Red Cross fair, the children sold cushions at $1.50 above cost, thereby gaining 50%. How much did each cost?

[With pencil]

1. A farmer made a profit of $50 by selling a cow at a gain of 40%. How much did it cost him? For how much did he sell it?

2. A druggist gained 150% by selling certain drugs at 60¢ above cost. What was the cost? the selling price?

3. Furs were sold at a profit of 75%. If in one sale $276 was gained, how much did the furs cost? For how much were they sold?

4. A grocer made a profit of 8½¢ on every pound of coffee he sold. If he gained 25%, how much did he pay for the coffee?

5. Owing to a fire a stock of goods was sold at a loss of 15%. If the loss was $1200, what was the cost of the goods? What was the selling price?

6. During the World War a certain landlord sold his house at a loss of 18%, thereby losing $6300. How much did the house cost him? For how much did he sell it?

7. By selling his automobile to a dealer a man lost $210 or 5% of his investment. How much had he paid for it?

8. A diamond dealer sold certain rings at a profit of 150%. His actual gain on each ring was $240. How much had each cost him?

9. Candy was sold at the Red Cross counter in Ida's school at a profit of 125%. If $4 was gained during the week, how much was paid for the candy sold?

10. Books were sold at a sacrifice. If the owner lost $120 by selling at a loss of 15%, what was the cost of the books?

To find the cost when the selling price and the profit or loss per cent are given.

Example 1: A farm is sold for $4500 at a profit of 25%. Find the cost.

(a) WORK

Since the farm is sold at a *profit* of 25% (25% of the cost), the selling price is 25% more than the cost.
S. P. = 125% of C.
S. P. = $4500
Therefore, 125% of C. = $4500
C. = $4500 ÷ 1.25 = $3600, *Ans.*

(b) WORK

S. P. = $\frac{5}{4}$ of C.
= $4500
Therefore, $\frac{5}{4}$ C. = $4500
C. = $4500 × $\frac{4}{5}$
= $3600,
Ans.

Example 2: Remnants are sold for $60 at a loss of 20%. Find the cost.

(a) WORK

Since the remnants are sold at a *loss* of 20% (20% of the cost), the selling price is 20% less than the cost.
C. = 100% of C.
S. P. = 100% of C. − 20% of C.
= 80% of C.
S. P. = $60
Therefore, 80% of C. = $60
C. = $60 ÷ .8 = $75, *Ans.*

(b) WORK

S. P. = $\frac{4}{5}$ C.
S. P. = $60
$\frac{4}{5}$ C. = $60
C. = $60 ÷ $\frac{4}{5}$ = $75, *Ans.*

[Without pencil]

What per cent of the cost is each selling price?

	Selling Price	Rate of Profit	Rate of Loss
1.	$220	10%	—
2.	$ 80	—	20%
3.	$140	—	30%
4.	$240	20%	—
5.	$ 18	$12\frac{1}{2}\%$	—
6.	$ 24	—	25%
7.	$ 80	—	60%
8.	$ 40	50%	—
9.	$500	150%	—
10.	$120	—	40%
11.	$ 80	$33\frac{1}{3}\%$	—
12.	$ 50	—	$37\frac{1}{2}\%$
13.	$ 30	—	$66\frac{2}{3}\%$
14.	$140	75%	—
15.	$ 50	100%	—
16.	$ 26	$62\frac{1}{2}\%$	—

17. Find the cost in examples 1 to 16.

Find the cost and the profit or the loss:

	Selling Price	Rate of Profit	Rate of Loss
18.	$ 400	$33\frac{1}{3}\%$	—
19.	$ 600	—	40%
20.	$ 800	—	20%
21.	$1200	20%	—
22.	$ 300	—	25%
23.	$ 500	25%	—

Find the cost and the profit or the loss: [With pencil]

	Selling Price	Rate of Profit	Rate of Loss
1.	$ 150	—	25%
2.	$ 400	$14\frac{2}{7}\%$	—
3.	$ 174	16%	—
4.	$ 36.75	—	30%
5.	$1300	4%	—
6.	$ 660	—	12%
7.	$ 82	$2\frac{1}{2}\%$	—
8.	$3300	120%	—
9.	$3120	160%	—
10.	$ 345	—	8%
11.	$ 26.10	45%	—
12.	$ 985	—	$1\frac{1}{2}\%$

PROBLEMS [Without pencil]

1. A hat was sold for $6 at a profit of 100%. How much did it cost?

2. A piano was sold for $250 at a profit of 25%. What was the cost?

3. By selling a machine for $80 a dealer made a profit of $33\frac{1}{3}\%$. What was the cost? the gain?

4. A man lost 10% by selling a slightly damaged desk for $27. What was the cost?

5. Certain shopworn dresses were sold for $80, at a loss of 20%. Find the cost.

6. Mr. Allison sold his automobile for $1800, at a loss of 25%. How much did it cost him?

7. A man lost $12\frac{1}{2}\%$ in selling his talking machine. What was the cost if the selling price was $70?

8. Ribbon was sold at a profit of 50%. Find the cost when the selling price was $1.50 per yard.

9. A manufacturer made a profit of 40% by selling dresses for $140. How much did they cost him?

10. If a profit of 150% was made by selling yarn for $50, what was the cost?

☞ *Note carefully what is given and what is required. Check all work to make sure that your answer is correct.*

[With pencil]

1. Find the cost of a hat which when sold at $7.40 gives a profit of 48%.

2. An automobile was sold for $1100 at a loss of 12%. Find the cost and the loss.

3. If by selling certain ornaments at $29 a dozen a manufacturer made a profit of 45%, how much money did he gain?

4. By selling potatoes at $3.50 a bushel, a grocer made a profit of 40%. How much did he pay for the potatoes?

5. A man retiring from business sold his goods for $1300, thereby losing 35%. How much did he lose?

6. By selling books for $120, a bookseller lost $33\frac{1}{3}\%$. Find the cost.

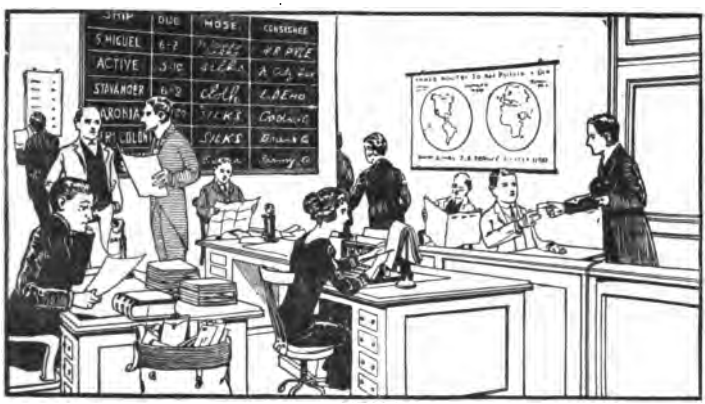
7. A boy lost $12\frac{1}{2}\%$ by selling his skates for $3.50. Find his loss.

8. A dealer sold a pair of skates for $8.40, making a profit of 20%. How much did the skates cost him?

9. A druggist gained 200% by retailing a certain drug at $2.40 an ounce. How much did it cost him?

10. A merchant made a profit of 150% on velvet which he sold for $2.25 a yard. Find the cost.

Business Transactions of a Merchant



[With pencil]

1. Mr. Jonathan F. Findlay is a dealer in cloth and silk. Last week he imported 150 yd. of serge at 4*s.* 6*d.* per yard and 400 yd. of cheviot at 6*s.* 3*d.* per yard. How much did he pay for these in United States money? (Use 1*s.* = $.25.)

2. He sold the serge at $2 per yard, less 5% discount, and the cheviot at $3 per yard, less a discount of 6%. How much did he receive for all?

3. What was his per cent of profit on these goods, if in addition to the cost of the goods he paid $148.25 duty?

4. He imported dress silk from France as follows: 25 pieces, each containing 16 yd., at 3 fr. 50 c. per yard, and 10 pieces, each containing 15 yd., at 4 fr. per yard. He paid a duty of 60% of the list price in addition. How much did he pay in our money for the goods? (Use 1 fr. = $.20.)

5. He sold all the silk at $2 per yard. What per cent of profit, to the nearest tenth per cent, did he make, if he allowed a discount of 10%?

Review

Find the missing terms in the following: [Without pencil]

	Cost	Rate of Profit	Rate of Loss	Profit	Loss	Selling Price
1.	$102	3%	—	?	—	?
2.	?	—	75%	—	$18	?
3.	?	50%	—	?	—	$2400
4.	?	—	?	—	$10	$ 40
5.	$ 24	?	—	$72	—	?
6.	?	?	—	$28	—	$ 112
7.	$ 18	?	—	?	—	$ 27
8.	?	—	20%	—	?	$1200
9.	$105	5%	—	?	—	?
10.	?	20%	—	?	—	$1200
11.	?	—	30%	—	?	$ 140
12.	$150	—	8%	—	?	?
13.	?	$12\frac{1}{2}\%$	—	?	—	$ 180
14.	?	—	15%	—	?	$ 850
15.	$200	25%	—	?	—	?
16.	?	?	—	$50	—	$ 150
17.	?	—	10%	—	$50	?
18.	?	—	?	—	$50	$ 200
19.	?	—	35%	—	?	$ 65
20.	?	15%	—	?	—	$ 115

COMMISSION



Any one rendering service of any kind may be paid therefor with a salary or a *commission* or both.

When the pay given for buying or selling or collecting is reckoned at a certain per cent of the price, it is called **commission.**

The person rendering the service is known as **a commission merchant, agent,** or **broker.**

The person for whom the service is rendered is called the **principal** (employer).

The *entire* amount received by the commission merchant is called the **gross proceeds.**

The sum left after the commission has been paid is called the **net proceeds.**

Problems in commission are percentage problems in which:

The **base** is the **value of the goods** bought, sold, collected, or exchanged. (Cost, selling price, exchange price, etc.)

The **rate** is the **per cent of commission.**

The **percentage** is the **commission.**

The **difference** is the **net proceeds.**

To find the commission.

Example: A salesman sold $8424 worth of hats and received a commission of $7\frac{1}{2}\%$. What was his commission?

(a) Work	(b) Work
$8424, base	$R \times B = C$
$.07\frac{1}{2}$, rate	$.07\frac{1}{2} \times \$8424 = \$631.80$, commission, *Ans.*
42 12	
589 68	
$631.80, commission, *Ans.*	

To find the commission, multiply the value of the goods bought, sold, collected, or exchanged by the rate of commission expressed as a decimal or as a common fraction.

[Without pencil]

1. What commission did a salesman earn if he received 10% commission for selling $5000 worth of goods?

2. A book agent bought $2000 worth of rare books for a certain customer at a commission of 5%. What commission did he receive?

3. A real estate agent sold property for $80,000 for his principal, Mr. Elson. His commission was 1%. What was his commission?

4. A lawyer collected a debt of $800 for his client and charged a fee of 10%. How much did he receive for his services?

5. An auctioneer sold goods at auction on a commission basis. If his commission was 5% of all sales, how much did he earn last Monday when his sales amounted to $800?

6. Edgar sold 1000 Thrift Stamps one month. His father offered him a commission of 1% for his work. How much did he earn? If he bought Thrift Stamps with his commission, how many stamps did he buy?

7. A buyer in a department store received a yearly salary and a commission of 2% of all purchases made. Last year she bought $100,000 worth of dresses. What was her commission?

8. A salesman sold goods on a salary and commission basis. He received 5% of all sales. What commission did he earn if his sales amounted to $20,000?

9. A commission merchant sold $5000 worth of eggs and charged 5% commission. What was his commission?

Find the commission and the net proceeds in each of the following:

	Amount of Sales	Rate of Commission		Amount of Purchases	Rate of Commission
10.	$ 500	6%	15.	$ 350	10%
11.	$ 800	3%	16.	$1700	2%
12.	$1200	8%	17.	$1800	5%
13.	$4000	4%	18.	$2400	3%
14.	$7500	2%	19.	$1600	1½%

☞ *Check all work to test the correctness of your answers.*

[With pencil]

1. A salesman sold hats on a commission of 7½%. What commission did he earn if his sales amounted to $28,000?

2. A real estate agent charged 2½% for purchasing property for $24,500. What was his commission?

3. An agent sold 450 books at \$1.20 each and charged $8\frac{1}{2}\%$ commission. What was his commission? What were the net proceeds?

4. A commercial traveler (salesman) received a salary of \$1200 a year and a commission of $5\frac{1}{2}\%$ of all sales. His sales for last year amounted to \$65,000. How much did he earn last year?

5. A law firm collected 75% of a debt amounting to \$360 and charged 10% for collecting. What was the fee of the law firm?

6. Mr. Lowe bought 600 yd. of velvet, at \$1.62 a yard, through an agent, paying him a commission of 5%. How much did the velvet cost him?

7. Which was the better offer for a salesman, a yearly salary of \$4500 or a commission of $7\frac{1}{2}\%$, if his yearly sales amounted to \$75,000? how much better?

8. Which was the better offer for a commission merchant, and how much better, a commission of $2\frac{1}{2}¢$ a bushel or $2\frac{1}{2}\%$ of all the sales, when he sold 500 bu. at 60¢ a bushel?

9. Find the gross cost of the following purchases:

a. 350 yd. of velvet @ \$3.20; commission $2\frac{1}{2}\%$; freight \$1.80.

b. 800 lb. of coffee @ $20\frac{1}{2}¢$; commission 2%; freight \$2.50.

Find the commission and net proceeds:

	Sales	Rate of Commission		Sales	Rate of Commission
10.	\$ 1800	$3\frac{1}{4}\%$	**15.**	\$64,800	$1\frac{1}{8}\%$
11.	\$ 3600	$2\frac{1}{2}\%$	**16.**	\$12,500	$1\frac{2}{5}\%$
12.	\$ 8450	$5\frac{1}{2}\%$	**17.**	\$10,640	$6\frac{1}{4}\%$
13.	\$ 9200	$7\frac{1}{2}\%$	**18.**	\$14,482	$4\frac{1}{2}\%$
14.	\$35,000	$1\frac{3}{4}\%$	**19.**	\$12,796	$5\frac{1}{2}\%$

To find the rate of commission.

☞ *Remember that the commission is always some per cent of the sum of money used in the transaction* (usually the price of what is bought or sold).

Example: An agent sold $4000 worth of goods and received a commission of $200. What was the rate of his commission?

Work

(1) Analysis Method

Since $200 is the commission paid for selling $4000 worth of goods, the commission is $\frac{200}{4000}$ of the sale price (base), or $\frac{1}{20}$, or 5%, of the sale price, *Ans.*

(2) Equation Method

$R \times B = P$

$R \times$ sale price = commission

$R \times \$4000 = \$200$

$R = \frac{200}{4000}$ of sale price

$= \frac{1}{20}$, or 5%, of sale price, *Ans.*

[Use pencil when needed]

Find the rate of commission:

1. Sale price $600, commission $60.
2. Purchase price $500, commission $10.
3. Purchase price $1500, commission $300.
4. Sale price $10,000, commission $500.
5. Sale price $20,000, commission $2000.
6. For selling $20 worth of tickets for the school entertainment, Alfred received $2 commission. What per cent commission did he receive?
7. George sold magazines on a commission. He received $5 for selling $50 worth of magazines. What per cent commission did he receive?
8. His brother received $5 from another firm for selling $20 worth of magazines. What was the rate of his commission?

9. An agent received $120 for collecting $6000 in rents. What was the rate of his commission?

10. For collecting a debt of $2000 a lawyer charged a fee of $400. What per cent did he charge?

11. A real estate agent received $1000 for selling property for $100,000. Find the rate of his commission.

12. A commission of $20 was paid a salesman for selling $400 worth of goods. Find the rate of his commission.

[With pencil]

1. An agent's commission for selling $950 worth of cloth was $47.50. Find the rate of his commission.

2. A salesman's commission for selling $92.40 worth of brushes was $4.62. What was the rate of his commission?

3. For selling property for $12,000, a real estate agent received a commission of $180. What was the rate of his commission?

4. Louis received $1.50 for selling 50 copies of magazines at $.15 each. What per cent commission was that?

5. A lawyer was directed to collect an account of $800. He collected 75% of the account and charged a fee of $90. Find the rate of commission.

6. An agent received $48 out of the $320 paid by one of his clients to the insurance company by whom he is employed. What per cent of commission did he receive?

7. An auctioneer selling on a commission basis received $1050 for selling property for $21,000. Find the rate of his commission.

8. A commission merchant remitted $270 to his principal, after deducting his commission of $30. Find the rate of his commission.

9. If the gross proceeds are \$450 and the net proceeds are \$432, what is the rate of commission?

10. Find the rate of commission when the net proceeds are \$425 and the commission is \$25.

11. What per cent of commission is charged by an agent who retains \$60 and remits \$940 to his employer?

12. What per cent is charged by a commission house for selling a quantity of oranges for \$360 if \$320 is remitted to the principal?

To find the value of goods bought or sold (gross receipts) when the commission and the rate are given.

Example: A salesman receives 5% commission for selling goods. Find the amount of his sales if his commission is \$6000.

(a) WORK	(b) WORK
Since the commission is a certain per cent of the sale price,	$R \times B = P$
\$6000 = 5% of the sales	$.05 \times B = \$6000$
or .05 of sales = \$6000	$B = \$6000 \div .05$
Sales = \$6000 ÷ .05	= \$120,000, *Ans.*
= \$120,000, *Ans.*	

☞ *Be careful to note what is given and what is required. Check all work to insure accuracy.*

Find the cost or the selling price: [Without pencil]

COMMISSION	RATE OF COMMISSION	COMMISSION	RATE OF COMMISSION
1. \$ 60	10%	**4.** \$50	2%
2. \$100	5%	**5.** \$12	3%
3. \$ 20	1%	**6.** \$60	6%

7. For selling an automobile on a commission of 10%, an agent received a commission of \$80. For how much did he sell the automobile?

8. A lawyer charged a commission of 20% for collecting a certain debt. If his fee was $100, what amount did he collect?

9. A real estate agent received a commission of $75 for collecting rents on a commission of 5%. Find the amount of rent collected.

10. If Edgar earned $5 by selling magazines on a commission of 20%, what was the value of the magazines sold?

[With pencil]

1. A commission merchant charged 2½% commission for selling flour. If his commission on one sale was $500, what was the value of the flour sold?

2. A real estate agent charged 2½% for buying and selling property. If his fee for selling a piece of land was $300, for how much did he sell the land?

3. A hat salesman earned $1500 commission by selling on a commission of 7½%. What was the amount of his sales?

4. A buyer's commission in one transaction was $56.70. If he bought goods on a commission of 3%, what was the cost of the goods bought?

5. A collector whose rate of commission is 2½% received $60 for collecting rents in one building. How much rent did he collect?

TAXES



All governments require money to pay their expenses. Thus, our national government requires large sums of money to support the army and the navy, to pay the salaries of employees, pensions, etc. The state and city governments require money to pay for roads, bridges, schools, police, etc. The money required for all these expenses is raised for the most part by *taxes*, *fees*, *licenses*, and *fines*.

A **tax** is a sum of money levied (placed) on persons and property to cover the expenses of the government.

There are two kinds of taxable property — *personal* and *real*.

Property which is fixed, which cannot be moved, such as land, buildings thereon, etc., is called **real property** or **real estate**.

Property which is movable, such as money, merchandise, etc., is called **personal property**.

The state and the city derive their revenue almost entirely from taxes levied on real and personal property. The state and the county derive part of their revenue from a tax levied on towns and cities, from a tax on automobiles, and from a tax on incomes.

The national government derives a large part of its revenue from a tax or duty on articles imported from other countries, and from a tax on incomes.

The tax levied on property is called a **property tax.**

The tax levied on persons is called a **poll tax.**

The tax placed on a man's income is called an **income tax.**

The tax placed on imported goods is called **duty** (tariff).

Property Taxes

After the government officials of a city or town determine how much money is needed to defray the expenses for the year, certain officials, called *assessors*, place a value upon, or assess, the property in that city or town. (The assessed value is usually only a part of the real value.) By dividing the total expenses for the year by the total assessed value of taxable property, the officials determine the **tax rate**, which may be expressed in several ways, the most common being:

a. A certain number of mills on each dollar of assessed valuation; thus, 17 mills on the dollar.

b. A per cent; as, 1.7%.

c. A certain number of dollars or cents on each hundred dollars of assessed valuation; thus, $1.70 on each $100.

d. A certain number of dollars on each thousand dollars of assessed valuation; thus, $17 on each $1000.

The person who collects the property taxes is called the **tax collector.**

To find the property tax.

Example: Mr. Ely's house is assessed at $10,000. What is his tax, if the tax rate is $2.12?

(a) WORK

Assessed value = base
Tax = percentage
Tax rate = 2.12%
$10,000, assessed value
.0212, rate
$212.0000, tax, *Ans.*

(b) WORK

Tax rate is $2.12 on every $100
$10,000 = 100 × $100
Therefore, tax = 100 × $2.12
= $212, *Ans.*

PROBLEMS [Without pencil]

1. State each of the following tax rates in two other ways: 2.8%, 32 mills, $2.52.

2. What is the tax rate in your city?

3. If the board of assessors assesses property at $\frac{2}{5}$ of its real value, for what amount should Mr. Horace's land, valued at $10,000, be assessed?

4. If the tax rate is 2%, what is Mr. Atkin's tax on property assessed at $4000?

5. How much tax must Mr. Lewis pay on property assessed at $5000 when the tax rate is 20 mills?

6. Mr. Lamont of town A pays a tax at the rate of $2.58; Mr. Walters of town B pays a tax at the rate of 24 mills; and Mr. Dawkins of town C pays a tax at the rate of 2.6%. Who pays the most? If each has property assessed at $1000, how much does each pay?

7. A tax of $.0027 on a dollar is how much on $100? on $1000?

8. If the tax rate is 4 mills on each dollar, find the tax on property assessed at $10,000.

Find the tax:

	Assessed Value	Tax Rate		Assessed Value	Tax Rate
9.	$ 1,000	2 mills	14.	$ 4,000	$ 2.50 per $100
10.	$ 5,000	4 mills	15.	$ 6,000	$ 3.00 per $100
11.	$10,000	3 mills	16.	$ 5,000	$ 2.20 per $100
12.	$ 5,000	$1\frac{1}{2}$ mills	17.	$12,000	$25 per $1000
13.	$ 6,000	$2\frac{1}{2}$ mills	18.	$15,000	$30 per $1000

☞ *Check all work to insure accuracy.*

Find the tax: [With pencil]

	Assessed Value	Tax Rate	Tax
1.	$20,000	$1\frac{3}{4}\%$	?
2.	$18,500	$2.15 per $100	?
3.	$24,500	2.14%	?
4.	$15,600	2.21%	?
5.	$ 4,850	$12\frac{1}{2}$ mills	?
6.	$ 5,600	17 mills	?
7.	$24,000	$2.56 per $100	?

8. What is the tax rate in your city this year? What is the tax on property assessed at $8500?

9. In a certain town a house is valued at $6400 and the tax rate is $18.52 per $1000. Find the tax.

10. What is the tax on property assessed at $12,600, when the tax rate is $16\frac{4}{5}$ mills?

11. When the tax rate is $1\frac{4}{5}\%$, find the tax on property assessed at $16,500.

12. At 12 mills on the dollar, how much is the tax on a farm of 120 acres, worth \$100 an acre, assessed for only $\frac{3}{5}$ of its value?

13. If the tax rate is \$20.80 per \$1000, what are the taxes paid by a man who owns a house assessed at \$6800 and land assessed at \$4500?

14. The tax rate in Manhattan in 1919 was \$2.32 per \$100. What tax was Mr. Halstead required to pay on a house assessed at \$7500?

Federal Income Tax

The United States obtains part of the money it needs to run the government by taxing incomes. The tax on incomes of citizens of the United States levied under the United States law is known as the **Federal income tax.**

Before the World War this law required every unmarried person to pay an annual tax of 1% of the amount of his or her income over \$3000, and married persons living together an annual tax of 1% of the amount of their joint income over \$4000. Thus, if an unmarried man's income in 1915 was \$5000, he was required to pay an income tax of 1% of \$2000, or \$20; if a married man's income was \$5000, his income tax was 1% of \$1000, or \$10.

On incomes over \$20,000, an additional tax (**surtax**) was levied.

During and after the World War laws were passed calling for much larger income taxes. Thus, in 1918, unmarried citizens were required to pay a tax of 2% of the amount of their income above \$1000, and married citizens had to pay 2% of the amount of their income above \$2000; in 1919 and 1920, unmarried citizens were required to pay a tax of 4% of their income above \$1000, while married citizens had to pay 4% of the amount of their income over \$2000.

Incomes over $5000 were taxable at higher rates.
Find out the income tax rate for the present year.

[Use pencil when needed]

1. Mr. Tilden, an unmarried man, had a net income of $4500 in 1919. Find the income tax he paid. (Subtract $1000; 4% of $3500 = ?)

2. Miss Alston's net income for 1919 was $3500. What income tax did she pay?

3. Find the income tax on the following net incomes of unmarried men in 1919: $3000, $3500, $3750.

4. Find the income tax on the above net incomes (example 3) of married men.

5. Henry Lane, a single man, earned a salary of $2500 in 1919, and had an income of $1000 from rent and $500 from taxable bonds. What was his tax?

6. In 1920 Miss Lillian Lowe earned a salary of $1600. What income tax did she have to pay?

7. In 1920 Samuel Smythe, unmarried, earned a salary of $3000. What income tax did he pay?

8. A stenographer earned a salary of $1250 in 1920. If unmarried, what income tax did she have to pay?

9. Mr. Arthur Doane, married, had a net income of $5000 in 1920. What income tax was he required to pay?

10. What income tax was levied in 1920 on the following net incomes of unmarried women: $4000, $2000, $3000, $5000, $3500?

11. Find the income tax levied in 1920 on the following net incomes of married men: $4500, $2500, $6025, $8200, $9025.50.

INTEREST



Money paid for the *use* of money is called **interest.**

The sum of money for the use of which interest is paid is called the **principal.**

The sum of the *principal* and the *interest* is called the **amount.**

Interest is a certain per cent of the principal.

The **rate of interest** is the per cent of the principal paid for the use of money for a *given time.* The rate of interest in all problems is for *one year,* unless otherwise specifically stated. Thus, 6% interest means 6% of the principal for *one year.*

The terms in interest are:

Principal	**(Base)**
Rate	**(Rate)**
Interest	**(Percentage)**
Amount	**(Amount)**

The legal rate of interest varies from 6% to 12% in the different states. In most states, including New York, it is 6%. That is, the law allows one to charge as much as 6% interest, but no more.

To find the interest.

Example 1: Find the interest on \$500 for 2 yr. at 4%.

WORK

Rate × Principal = Interest for 1 yr.
$2 \times R \times P$ = Interest for 2 yr.
$2 \times .04 \times \$500 = \$40$, interest, *Ans.*

Example 2: Find the interest on \$1000 for 3 mo. at 4%.

WORK

3 mo. $= \frac{3}{12}$ yr. or $\frac{1}{4}$ yr.; $\frac{1}{4}$ of 4% = 1%
1% of \$1000 = \$10, interest, *Ans.*

Find the interest for 1 yr. on: [Without pencil]

	a	*b*
1.	\$400 at 4%	\$2500 at 2%
2.	\$200 at 5%	\$5000 at 6%
3.	\$600 at 3%	\$1000 at $2\frac{1}{2}$%

Find the interest for 1 yr. on:

4.	\$3000 at $3\frac{1}{2}$%	\$6000 at $5\frac{1}{2}$%
5.	\$4000 at $4\frac{1}{2}$%	\$ 400 at $4\frac{1}{4}$%

Find the interest at 4% on:

6.	\$300 for 2 yr.	\$ 800 for 4 yr.
7.	\$400 for 3 yr.	\$1000 for 5 yr.

Find the interest at 6% on:

8.	\$ 200 for 6 mo.	\$1200 for 2 mo.
9.	\$ 800 for 3 mo.	\$1600 for 3 mo.
10.	\$1000 for 4 mo.	\$2000 for 1 yr. 6 mo.
11.	\$1000 for 9 mo.	\$ 800 for 2 yr. 3 mo.

Find the interest on: [Use pencil when needed]

	a	*b*
12.	$700 for 2 yr. at 5%	$1000 for 9 mo. at 4%
13.	$500 for 3 yr. at 4%	$2000 for 1 yr. 8 mo. at 3%
14.	$600 for 3 mo. at 6%	$4000 for 2 yr. 4 mo. at 3%
15.	$800 for 4 mo. at 3%	$5000 for 1 yr. 6 mo. at 4%
16.	$900 for 8 mo. at 3%	$6000 for 2 yr. 9 mo. at 4%

Find the interest on each of the following:

	Principal	Rate	Time
17.	$ 600	5%	2 yr. 6 mo.
18.	$ 750	6%	2 yr. 3 mo.
19.	$ 1250	4%	2 yr. 4 mo.
20.	$ 3750	3%	1 yr. 4 mo.
21.	$ 6000	6%	1 yr. 2 mo.
22.	$ 800	$2\frac{1}{2}$%	1 yr. 6 mo.
23.	$ 900	$4\frac{1}{2}$%	2 yr. 3 mo.
24.	$ 2000	6%	1 yr. 10 mo.
25.	$ 1800	4%	1 yr. 7 mo.
26.	$ 600	$3\frac{1}{2}$%	1 yr. 2 mo.
27.	$ 275	6%	2 yr. 8 mo.
28.	$ 425	5%	2 yr. 6 mo.
29.	$ 3150	6%	2 yr. 9 mo.
30.	$ 1345	3%	1 yr. 2 mo.
31.	$ 540	5%	2 yr. 7 mo.
32.	$ 6040	4%	1 yr. 8 mo.
33.	$25,000	$1\frac{1}{2}$%	10 mo.
34.	$ 340	$3\frac{1}{2}$%	1 yr. 3 mo.
35.	$ 1250	$4\frac{1}{2}$%	1 yr. 8 mo.
36.	$ 685	$5\frac{1}{2}$%	8 mo.

To find the interest for years, months, and days.

In computing simple interest, a month is regarded as 30 days, and a year as 360 days.

Example: Find the interest on \$500 for 1 yr. 6 mo. 15 da. at 4%.

CANCELLATION METHOD

WORK

Since rate × principal = interest for 1 yr., reduce the given time to years and then multiply the interest for 1 yr. by the given number of years.

1 yr. = 360 da.
6 mo. = 180 da.
15 da. = 15 da.
555 da.

Given time = 555 days or $\frac{555}{360}$ yr.

Therefore, $\frac{555}{360} \times \frac{4}{100} \times \$500 = \frac{\$555}{18} = \$30.83$, interest, *Ans.*

Find the interest to the nearest cent, discarding less than ½¢ and counting an extra cent for ½¢ or a greater fraction of a cent.

Write figures carefully and neatly. Check all work.

Find the interest on the following: [With pencil]

	PRINCIPAL	RATE	TIME
1.	\$ 225	5%	48 da.
2.	\$ 190	6%	60 da.
3.	\$ 1870	4%	85 da.
4.	\$ 1220	3%	160 da.
5.	\$ 2500	5%	240 da.
6.	\$ 1600	4%	320 da.
7.	\$ 460	3%	132 da.
8.	\$ 1800	6%	195 da.
9.	\$10,000	6%	1 da.
10.	\$20,000	4%	2 da.

Find the interest and the amount:

	Principal	Rate	Time
11.	$ 240	6%	6 mo. 15 da.
12.	$ 720	4%	8 mo. 12 da.
13.	$ 960	5%	4 mo. 15 da.
14.	$1220	5%	6 mo. 10 da.
15.	$ 250	4%	2 mo. 20 da.
16.	$ 350	6%	9 mo. 15 da.
17.	$1200	4%	1 yr. 6 mo. 12 da.
18.	$2800	4%	2 yr. 3 mo. 18 da.
19.	$ 900	6%	2 yr. 3 mo. 5 da.
20.	$1200	5%	1 yr. 6 mo. 24 da.
21.	$1875	4%	1 yr. 7 mo. 21 da.
22.	$ 950	3%	1 yr. 6 mo. 20 da.
23.	$2400	5%	1 yr. 9 mo. 24 da.
24.	$1275	3%	2 yr. 2 mo. 12 da.
25.	$ 850	2%	2 yr. 9 mo. 20 da.
26.	$1000	$2\frac{1}{2}$%	1 yr. 4 mo. 12 da.
27.	$1250	$3\frac{1}{2}$%	1 yr. 6 mo. 20 da.
28.	$1500	$4\frac{1}{2}$%	2 yr. 4 mo. 10 da.
29.	$ 600	$4\frac{1}{2}$%	1 yr. 4 mo. 10 da.
30.	$ 480	$4\frac{1}{4}$%	6 mo. 12 da.
31.	$3600	$3\frac{1}{2}$%	9 mo. 20 da.
32.	$2400	$5\frac{1}{2}$%	2 yr. 4 mo. 15 da.
33.	$1800	$3\frac{3}{4}$%	1 yr. 8 mo. 10 da.
34.	$ 320	$2\frac{1}{2}$%	7 mo. 10 da.
35.	$ 156	$4\frac{1}{8}$%	2 yr. 3 mo. 15 da.
36.	$ 290	$3\frac{1}{2}$%	8 mo. 24 da.

To find the interest when the time given is that between two dates.

When the time between the given dates is less than one year, it is customary to compute the interest for the exact number of days between the dates, counting 360 days to the year. Thus:

Example 1: Find the interest on \$1000 at 4% from May 5 to June 12.

WORK

Find the exact number of days from May 5 to June 12.

Days left in May = 26 da.
Days in June = 12 da.
38 da.

$$\frac{38}{\cancel{360}\ 9} \times \frac{\overset{1}{\cancel{4}}}{\cancel{100}\ 1} \times \overset{1}{\cancel{\$1000}\ \cancel{10}} = \frac{\$38}{9} = \$4\tfrac{2}{9} = \$4.22, \text{ interest, } \textit{Ans.}$$

When the time between the given dates is more than a year, it is customary to compute the interest for the number of years, months, and days, found by compound subtraction. Thus:

Example 2: Find the interest on \$1000 at 4% from May 5, 1920, to June 12, 1921.

WORK

Find the time in years, months, and days by compound subtraction and then proceed as formerly.

yr.	mo.	da.	
1921	6	12	1 yr. = 360 da.
1920	5	5	1 mo. = 30 da.
1	1	7	7 da. = 7 da.
			397 da.

$$\frac{397}{\cancel{360}\ 9} \times \frac{\overset{1}{\cancel{4}}}{\cancel{100}\ 1} \times \overset{1}{\cancel{\$1000}\ \cancel{10}} = \frac{\$397}{9} = \$44\tfrac{1}{9} = \$44.11, \text{ interest, } \textit{Ans.}$$

Find the interest and the amount: [With pencil]

	Principal	Rate	Time
1.	$ 800	4%	Jan. 5, 1918 to Nov. 26, 1918
2.	$1950	5%	Mar. 10, 1919 to Dec. 23, 1921
3.	$1100	6%	Oct. 20, 1918 to Jan. 15, 1919
4.	$2220	3%	Dec. 5, 1918 to Mar. 12, 1920
5.	$ 600	4½%	Apr. 20, 1919 to Dec. 5, 1921
6.	$1080	3½%	Jan. 17, 1919 to May 3, 1920
7.	$ 740	5½%	Feb. 20, 1920 to Oct. 10, 1922
8.	$ 650	9%	May 5, 1920 to Apr. 10, 1921
9.	$ 750	4%	May 22, 1920 to Mar. 16, 1922
10.	$ 840	5½%	Apr. 25, 1919 to Sept. 15, 1922
11.	$ 480	4½%	Dec. 12, 1919 to Feb. 9, 1920
12.	$ 360.80	5%	Sept. 25, 1919 to June 6, 1920
13.	$ 600.50	3%	Nov. 15, 1920 to Mar. 8, 1922
14.	$4250	5½%	Apr. 28, 1919 to June 4, 1921
15.	$6200	6%	July 18, 1920 to Sept. 5, 1922

PROBLEMS [Use pencil when needed]

1. Mr. Atkins borrowed $600 from his bank for 90 days at 6% interest. How much interest did he pay?

2. A member of a Building and Loan Association borrowed $500 from the Association on excellent security, promising to repay with interest at the rate of 6%. How much was due at the end of 6 mo.?

3. Mr. Byrnes borrowed $1200 from Mr. Ryan on Mar. 18 at the rate of 6%. He returned it with interest on July 12 of the following year. How much did he return?

4. A bill of $800 should have been paid on June 4, 1920. It was paid Aug. 15, 1921, with interest at 5%. How much interest was paid?

5. Mr. Peterson invested $4000 which yielded him a dividend (interest) of 12% per annum. What was his annual dividend?

6. Mr. Ward borrowed $2000 at the legal rate of interest (6%) and invested it in merchandise that he sold immediately at a profit of 25%. He settled his debt 1 mo. later. What was his net profit?

7. On Aug. 9 a speculator borrowed $5000 at 5% interest to invest in a certain house, which he later sold for $6000. After paying his debt with interest on Oct. 20, what was his net profit?

8. A debt of $2500 was due on July 9, 1920. It was paid on Sept. 4, 1921 with interest at 4½%. How much was paid?

9. A man bought some property for $8500, paying $6000 in cash, and promising to pay the rest in 2 yr., with interest at 5½%. How much must he pay at the end of 2 yr.?

10. John inherited $2000 from his grandfather, which his father invested in a mortgage bearing 6% interest. What was the annual income (interest) from this investment?

11. A certain bank paid 3½% interest on money deposited in it and lent this money to depositors at 6%. How much did it make in 6 mo. on deposits amounting to $20,000?

12. Henry bought a $100 Liberty bond of the first issue (1917), bearing interest at the rate of 3½%, payable semiannually. How much interest did he get every 6 mo.?

13. His sister Louise bought a $100 Liberty bond of the third series (1918), bearing interest at the rate of 4¼%. She de-

cided to save her interest. How much had she saved at the end of 5 yr.?

14. Anna deposited her money in a savings bank paying 4% per annum, interest payable semiannually. If she had $150 in the bank on Jan. 1 and did not withdraw any, with what interest should the bank credit her on July 1?

15. Mr. Harrison borrowed $800 for business purposes. He paid his debt with interest at 6% 75 days later. How much did he pay?

The Six Per Cent Method

By the six per cent method, we find the interest on $1, then multiply it by the number of dollars in the principal.

Example: What is the interest on $520 at 6% for 1 yr. 8 mo. 18 da.?

WORK

At 6% the interest on $1 for 1 yr. $= \$.06$
for 1 mo. $= \frac{1}{12}$ of $\$.06 = \$.005$
for 1 da. $= \frac{1}{30}$ of $\$.005$
$= \$.000\frac{1}{6}$

At 6% the interest on $1 for 1 yr. $= \$.06$
for 8 mo. $= 8 \times \$.005 = \$.04$
for 18 da. $= 18 \times \$.000\frac{1}{6} = \$.003$
The interest on $1 for 1 yr. 8 mo. 18 da. $= \$.103$
The interest on $520 for 1 yr. 8 mo. 18 da. $= 520 \times \$.103$
$= \$53.56$, *Ans.*

☞ *Remember:*

1. To get the interest at 6%, multiply $.06, $.005, $.000$\frac{1}{6}$ by the given number of years, months, and days, respectively. Add the results, and multiply by the number of dollars in the principal.

2. To get the interest *at any rate*, using the 6% method, divide the interest at 6% for the given time by 6, and multiply by the number in the given rate.

Thus, in the example on page 159, if the rate were 5% instead of 6%, the interest would be $\frac{5}{6}$ of \$53.56 or \$44.63$\frac{2}{6}$, which, *to the nearest cent*, equals \$44.63.

The Sixty-day Method

The sixty-day method is used by some business men. It is the 6% method with short cuts.

As 60 days = $\frac{1}{6}$ of a year, the interest for 60 days at 6% is 1% or $\frac{1}{100}$ of the principal.

Divide the given time into periods of 2 months or multiples or fractional parts thereof.

Example: What is the interest on \$400 for 126 days at 6%?

WORK

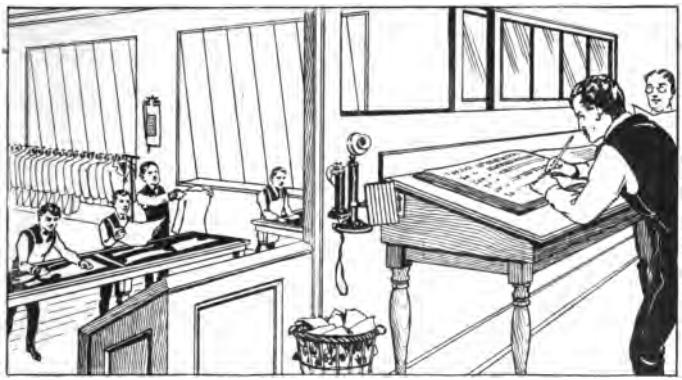
The interest on \$400 for 60 days at 6% = \$4
The interest on \$400 for 120 days at 6% = 2 × \$4 = \$8
The interest on \$400 for 6 days at 6% = $\frac{1}{10}$ of \$4 = \$.40
The interest on \$400 for 126 days at 6% = \$8.40, *Ans.*

Apply this method to examples on the previous pages.

BUSINESS TRANSACTIONS OF A MANUFACTURER

1. Mr. Benjamin Arnold was a manufacturer of dresses, suits, and cloaks. He sold goods on the following terms: 6/10, 5/30. Last week he sold \$8000 worth of dresses at 6/10, and \$6000 worth at 5/30. What was the net price paid for these goods?

2. The materials used for a certain style of dress cost him \$12.50 per dress, less 10% discount. If his overhead charges (rent, light, etc.) amounted to \$1.25 per dress and the labor cost \$8.50, what per cent of net profit did he make by selling each dress for \$30, less a discount of 5%?



3. Mr. Arnold employed three salesmen on a commission basis. Each received $7\frac{1}{2}\%$ commission on all sales. Mr. Lawrence sold \$4000 worth of dresses and suits last month, Mr. Allison sold \$3800 worth, and Mr. Jones sold \$6000 worth. What commission did each earn?

4. If the average monthly sales were \$35,000 and the net profits amounted to 10% of the sales, what were the net profits for the year?

5. A number of Mr. Arnold's customers failed in business and were unable to pay their debts. Such losses amounted to $3\frac{1}{2}\%$ of the annual sales. What were the losses due to failures?

6. During the year Mr. Arnold borrowed the following sums of money from his bank at 6% interest:

\$ 1500 for 2 mo.
\$ 2500 for 90 da.
\$ 5000 for 4 mo. 15 da.
\$ 3000 for 3 mo. 10 da.
\$10,000 for 2 mo. 3 da.
\$12,000 for 4 mo. 6 da.

How much did he pay as interest during the year?

REVIEW

1. Read the problem very carefully.
2. Note what is required.
3. Note what must be known to find that which is required. If it is not given, note what is given that will help to find it.
4. Write the facts given.
5. Perform the operations indicated.
6. Check all calculations.

[With pencil]

1. What per cent was lost by selling books that cost \$2.50 each at a loss of \$.75 each?

2. What per cent was gained by manufacturing hats at \$1.60 each and selling them at a gain of \$2.40 each?

3. A commission merchant received \$375 commission for selling merchandise for \$5000. Find his rate of commission.

4. A collector received $1\frac{1}{4}\%$ commission for collecting rents. How much did he earn per month, if his monthly collections amounted to \$24,000?

5. How much interest did a man receive for lending \$500 at 6% for 8 mo. 15 da.?

6. Millinery supplies listed at \$62.50 were sold at discounts of 10, 10, and 5. Find the net price.

7. Flowers costing 80¢ a dozen were sold at 50¢ a dozen. Find the loss per cent.

8. Shoes selling one year at \$11.50 per pair were sold a year later for \$14. Find the per cent of increase.

9. When flour cost \$6 a barrel wholesale it was sold at retail for $5\frac{1}{2}$¢ per pound. What was the gain per cent?

10. A salesman sold 20 doz. shirts at \$18.50 per dozen and 16 doz. shirts at \$27 per dozen. Find his commission at $7\frac{1}{2}\%$.

11. Change to common fractions and then add: $4\frac{1}{2}\%$, $\frac{3}{8}\%$, $2\frac{1}{4}\%$, $2\frac{1}{8}\%$.

12. A jobber made a profit of \$1.54 on every dozen hats he sold at a gain of 14%. Find the selling price per dozen.

13. Mrs. Richardson had to sell all her belongings immediately. She sold a talking machine at a loss of 25%, thereby losing \$17.50. For how much did she sell it?

14. A retail hatter received a discount of \$4.80 from a bill of goods listed at \$96. What was the rate of discount?

15. Mr. Horton paid \$164.70 to settle a bill of \$180. What per cent of discount was he allowed?

16. Golf balls selling at 65¢ each were raised in price to 85¢. Find the per cent of increase.

17. A magazine costing \$5 a year was offered to subscribers for \$4.50 a year. Find the per cent of reduction.

18. A department store sold 40 yd. of dress goods at \$1.45 a yard, and 70 yd. at \$1.75 a yard. The goods cost \$1.50 a yard. What per cent did the store gain or lose on all?

19. A dealer bought 200 overcoats at \$25 each. He sold 75% of them at a gain of 30%, and the remainder at a loss of 10%. Find the per cent of his gain or loss on the whole transaction.

20. An auctioneer was paid \$27.48 for his services for selling goods at 6% commission. What was the amount of the sale?

21. A profit of $16\frac{2}{3}\%$ was made by selling carpet at \$2.10 per yard. Find the cost and the gain per yard.

22. Bar pins were sold at a profit of 200%. If the selling price was \$.30 per pin, how much was gained on each pin?

23. A jeweler sold rings at an advance of 120%. How much was gained on a ring sold for $1100?

24. What was the cost of a dozen hats that were sold by a manufacturer for $30 at a profit of 150%?

25. Mr. Ramson sold $8\frac{1}{2}$ doz. suits, costing $22\frac{1}{2}$ each, at a profit of 25%. Find the gain.

26. Write as per cents and then add: $\frac{3}{100}$, $\frac{3}{400}$, $\frac{3}{5}$, $\frac{9}{200}$, $\frac{7}{8}$.

27. By selling cotton goods for $168 a man gained 12%. What was the cost?

28. A farmer sold his farm for $2700 at a loss of 10%. Find his loss.

29. A storekeeper retiring from business sold his goods at a sacrifice. He found that he had lost 35% by selling them for $3250. How much had the goods cost him?

30. When the rate of taxation was $2\frac{3}{5}$%, what amount of taxes was paid on property assessed at $12,500?

31. Property worth $18,500 was assessed at $\frac{3}{5}$ its value. Find the tax due if the rate was $16.80 per $1000.

32. Slightly damaged goods were sold for $141.75, at a loss of but $5\frac{1}{2}$%. Find the cost.

33. On May 5, 1920, Mr. Mack borrowed $450 at 5% interest. How much was due on Jan. 10, 1921?

34. An agent collected $95 and charged $2\frac{1}{2}$% commission. How much did the owner receive after paying the commission?

35. A dealer bought 20 gross of spools of cotton for $43.20 He sold them at $.02 each. Find the gain per cent.

36. A retailer bought hats at $36 per dozen, less 10% discount, and sold them so as to make a profit of 75%. Find the selling price per hat.

37. What per cent of a 24-hour day is a school day of 6 hr. 15 min.?

38. A man borrowed \$1200 at 6% interest and invested it in merchandise which he sold within 3 mo. at a profit of 30%. If at the end of this period he paid his debt, what was his net gain?

39. A peddler bought 200 bananas at 2 for 3¢ and sold them at 3¢ each. Find his rate of profit.

40. Mr. Brown needed \$4000 to buy certain merchandise which he could sell within 30 da. at a profit of 25%. His bank lent him the money for 30 da. at 6% interest. How much had he gained after paying his debt?

41. It was found that 28.9% of the 5,047,221 inhabitants of the City of New York bought Liberty bonds of the third issue. How many New Yorkers bought third Liberty bonds? (Drop the fraction.)

42. The government officials reported that 49,987 persons in Hoboken bought bonds of this issue. What per cent, to the nearest tenth per cent, of that city's population bought third Liberty bonds, if the population was 77,214?

43. There were 193,000 owners of passenger automobiles in the City of New York in September, 1918. Only .9% of these were seen on the streets on Sunday Sept. 8, owing to a request of the government to owners to save gasoline. How many automobile owners failed to heed the request?

44. The war tax on theater tickets in 1920 was 10%. How much did I have to pay for 4 orchestra seats, box-office price, \$2.50 each, 2 balcony seats at \$1.50 each, and 2 balcony seats at \$2 each?

45. The materials and labor on a petticoat amounted to \$2.50 and overhead charges to 10% of this sum. At what price must this petticoat be sold to gain 20%?

46. The war tax on club dues in 1920 was 10%. Mr. Lyons was a member of the following clubs:

Idlewild Country Club —— Annual dues $125
Progress Social Club —— Annual dues $150
Standard Club —— Annual dues $ 75

To how much did his club dues amount that year?

47. A French company bid against an American company for a contract of 2000 dolls. The French company offered to make them for $3\frac{1}{2}$ francs each, and the American company, for 65¢ each. Which was cheaper, and by how much in United States money? (Use the approximate normal value and also the approximate market value of the franc.)

48. Mr. A. owned property assessed at $36,000 and paid a tax of $2\frac{1}{2}$ mills on a dollar; Mr. B. owned property assessed at $39,000 and paid a tax of $2.40 per $1000. Whose tax bill was greater? how much greater?

49. A salesman who could sell $60,000 worth of goods a year received two offers: (1) a salary of $12 a week and $3\frac{1}{2}\%$ commission; (2) an annual salary of $3000. Which offer was the better, and by how much?

50. A kettle of water lost $33\frac{1}{3}\%$ of its contents in boiling, and then contained 5 qt. How much did it contain at first?

51. One year the tax rate of a certain city was $1.85 per $100. The next year it was raised to $1.96. Find the increase in taxes on property assessed at $65,000.

BUSINESS FORMS

Bills

A written statement of goods sold, or of services performed, giving (*a*) the names of the parties, (*b*) the date or dates, (*c*) the terms, (*d*) the items, (*e*) the price of each item, and (*f*) the total amount is called a **bill** or an **invoice**.

The **debtor** (buyer) is the one who owes something.

The **creditor** (seller) is the one to whom the debtor owes something.

Study the following bills, and mention all the important parts:

(*b*) *New York, Sept. 10, 1921*

(*a*) *Mr. Harold Kirk*

Bought of DAWSON and HUNT
MILLINERY SUPPLIES
240 Broadway

(*c*) Terms: *5/30*

(*d*)		(*e*)				
	2	*cans paste* @ *$2*	*4*	*00*		
	2	*gross lace wire* @ *$1*	*2*	*00*		
				(*f*)	*6*	*00*

The sign @ means "at the given price per unit." Thus, "2 gross @ $1" means "2 gross at $1 per gross."

(b) *New York, Oct. 5, 1921*

(a) Mr. *Alfred Johnson*

To EDWARD CALDWELL, Dr.
145 Spring Street

(c) Terms: *Net*

(d)			(e)		(f)	
		For Services rendered	*15*	*00*	*15*	*00*
		Received payment *Edward Caldwell*				

A **receipt** is an acknowledgment that the bill has been paid. It may be written on the bill itself, as shown above, or on a separate form, as below:

$15.00/100 *New York, N. Y., Oct. 6, 1921*

Received of *Alfred Johnson*

Fifteen 00/100 *Dollars*

in payment of bill of Oct. 5, 1921.

Edward Caldwell

When an employee receipts a bill, he writes the name of the firm and the word *per* followed by his own name or initials.

The terms of a bill are the conditions on which the sale has been made. They state the discounts offered and the time when the bill is due. The terms are often expressed as follows:

6/10 (6% discount if paid within 10 days).

5/30 (5% discount if paid within 30 days).

Net 30 days (no discount, payable within 30 days).

Net cash (no discount, payable immediately).

NOTE. In finding the various amounts of a bill, *drop a fractional part of a cent if it is less than* $\frac{1}{2}¢$, *and add another cent for every fractional part equal to* $\frac{1}{2}¢$ *or more.* Thus, $6\frac{1}{4}¢ = 6¢$; $6\frac{1}{2}¢ = 7¢$; $6\frac{3}{4}¢ = 7¢$.

1. What is a bill?

2. *a.* What is meant by a debtor? a creditor?

b. What is the abbreviation for "debtor"? for "creditor"?

3. What two forms are used for writing the names of the debtor and the creditor on a bill?

4. What form is used when a bill for labor, material, or services is made out?

5. What is meant by the terms of a bill?

6. When the buyer pays his bill, what should he demand as evidence of payment?

7. In what two common ways are receipts made out?

8. What is an invoice?

9. What is meant by selling on terms of 8/10? 6/30? net 10 days?

10. How should a clerk receipt a bill?

11. What is each line of entry on a bill called?

12. Why should a bill be dated?

13. Why should it be receipted when paid?

14. Why is it wise to keep receipted bills or receipts?

15. Why should a receipt be dated?

Make out bills for the following:

16. A. L. Sweet Company sold to F. R. Lowden:
Sept. 19 — 16 doz. Shirts @ $27
4½ doz. Shirts @ $18
Terms: 6/10, 5/30

17. J. G. Johnson Company sold to Philip Eaton:
Sept. 15 — 2½ doz. Hats @ $36
25 yd. Silk @ $ 1.50
Terms: 7/10, 5/30

18. M. R. Lewis sold to John Costigan:
Nov. 10 — 8 pcs. Velveteen 23½ yd. each at $1.20 per yard
4 pcs. Velveteen 22½ yd. each at $1.50 per yard
Terms: 2/10, Net/30

19. L. Stevenson sold to Arthur Herbert:



Oct. 4 — 160 yd. Cloth @ $2.62½
220 yd. Cloth @ $2.75
Terms: 6/10, 5/30

20. John F. Lenigan sold to Mason and Company:
Oct. 1 — 15 Suits @ $21½
18 Suits @ $28.75
Terms: 7/10, 6/30

Imagine that you are a bill clerk for L. Lockwood and Company, neckwear manufacturers. The following were Friday's sales. Make out a bill for each.

21. To S. Collins and Company — Terms 6/10, 5/30:
2½ doz. Four-in-hands, lot no. 112 @ $6
1¼ doz. Four-in-hands, lot no. 115 @ $8

22. To George Frazer — Terms 6/10, 5/30:

$2\frac{1}{3}$ doz. Bows, lot no. 1000	@	$ 7.50
$1\frac{1}{2}$ doz. Four-in-hands, lot no. 120	@	$15

23. To. L. M. Johnson — Terms 6/10, 5/30:

$2\frac{1}{6}$ doz. Four-in-hands, lot no. 150	@	$18
$1\frac{1}{4}$ doz. Four-in-hands, lot no. 115	@	$ 8
2 doz. Bows, lot no. 1000	@	$ 7.50

24. To A. C. Moore — Terms 6/10, 5/30:

$1\frac{1}{2}$ doz. Ascots, lot no. 480	@	$16
$2\frac{3}{4}$ doz. Four-in-hands, lot no. 160	@	$18
$1\frac{1}{4}$ doz. Bows, lot no. 1200	@	$15

25. To S. M. Andrews — Terms 6/10, 5/30:

15 doz. Four-in-hands, lot no. 110	@	$ 4.50
10 doz. Four-in-hands, lot no. 112	@	$ 6
$8\frac{1}{2}$ doz. Bows, lot no. 110	@	$ 7.50

A plumber employs you as his bill clerk and requires you to make out bills for the following:



26. Mr. F. L. Goodyear:

July 8 — Services rendered $8
July 9 — Services rendered $4.50
July 10 — Services rendered $7.50

27. Mr. M. R. Lane:

July 12 — Services rendered $ 6.80
July 12 — Materials supplied $12.60

28. Mr. Charles F. Monahan:

July 15 — Services rendered $6
July 16 — Materials supplied $4.80

29. Make out bills for:

a. a printer
b. a carpenter
c. a butcher
d. a dressmaker
e. a grocer
f. a physician

Statements

On the first day of each month every creditor sends each of his customers (debtors) who owe him any money for goods sold, a **statement** of the bills unpaid.

The following is a common form of statement:

(a) *New York, Oct. 1, 1921*

(c) *Mr. H. H. Allen*
Pittsburgh, Pa.

(b) **To The Derby Waist Company, Dr.**
30 West 40th Street

(d) *Terms: 8/10, 7/30*

(e)						
Sept.	*9*	*To Mdse.*	*180*	*00*		
	15	*To Mdse.*	*350*	*00*		
	26	*To Mdse.*	*480*	*00*		
				(f)	*1010*	*00*

Every statement should show:

(*a*) The date when written.

(*b*) The name and the address of the seller or creditor.

(*c*) The name and the address of the buyer or debtor.

(*d*) The terms.

(*e*) The items (date of each sale still unpaid, and the amount of each sale still unpaid).

(*f*) The total amount due, or footing.

As assistant bookkeeper for H. M. Rawlins, garment manufacturer, make out statements for the following unpaid bills, terms 6/10, 5/30:

1. To Louis M. Starr, Toronto, Ont.:

Apr. 9 — Mdse.	$82.50
Apr. 16 — Mdse.	$40.80
Apr. 27 — Mdse.	$52.75

2. To Arthur T. Moss, Albany, N.Y.:

Apr. 4 — Mdse.	$ 1.50
Apr. 12 — Mdse.	$ 75.60
Apr. 21 — Mdse.	$175.20

3. To Thomas F. Eaton and Company, Syracuse, N.Y.:

Apr. 9 — Mdse.	$260.10
Apr. 15 — Mdse.	$180.70
Apr. 26 — Mdse.	$450.20

4. To George M. Sears, Chicago, Ill.:

Apr. 5 — Mdse.	$460.75
Apr. 18 — Mdse.	$375.50
Apr. 25 — Mdse.	$520.60

5. To Daniel Boynton, Boston, Mass.:

Apr. 2 — Mdse.	$180.60
Apr. 15 — Mdse.	$212.40

6. To Marlton Company, Cleveland, Ohio:

Apr. 5 — Mdse.	$650.90
Apr. 12 — Mdse.	$718.87
Apr. 27 — Mdse.	$946.35

Paying by Checks

Every business man finds it necessary to keep a certain amount of money in a bank. When he wishes to make a payment, he usually writes an order directing his bank to pay the amount to some particular person.

The money which is put into a bank is called a **deposit** and the person who puts in the money is called a **depositor.**

A written order made by a depositor on his bank, directing the bank to pay money to a certain person, is called a **check.**

NOTE. Every depositor receives a book of blank checks. These checks are attached to *stubs*, which are left in the book when the checks are torn out, with a record of the number of the check, the date, the name of the person to whom it is to be paid, and the purpose for which it is given.

STUB	CHECK
No. 145 Date Feb. 25, 1921 To Albert Dalton For Bill, Feb. 1 Amt. $ 60 40/100	New York, Feb. 25, 1921 No. 145 **Chatham National Bank** Pay to the order of Albert Dalton ~~~~ $ 60 40/100 Sixty and 40/100 ~~~~ Dollars Wilbur Colby

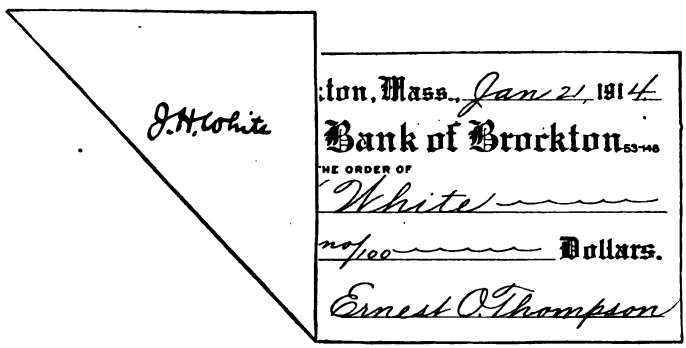
In the above check, Wilbur Colby, a depositor, orders his bank, the Chatham National Bank, to pay Albert Dalton $60.40.

Wilbur Colby is called the **drawer.**

Albert Dalton is called the **payee.**

Before a check is cashed it must be **indorsed.** This means that the payee must write his name on the back of the check (indorse it) before his bank or any other person will accept it.

The indorser is responsible for the payment of the check if the drawer fails to pay it. Thus, in the check below, if Ernest O. Thompson fails to pay the amount of the check, the bank will hold the indorser, J. H. White, responsible. The holder of a check thus has a claim against every person who indorses the check.



Things to know about checks.

1. Every check must have the following written on it:

a. Date.
b. Name of bank.
c. Name of payee.
d. Amount of money in figures and in words.
e. Name of drawer.

2. Before filling out a check, fill out the stub. It is an important record.

3. Any change made on a check makes the check of no value.

4. Before transferring a check to another person or to a bank *always* indorse it. Before accepting a check made out to another person, see that it is indorsed.

5. Checks made payable to *bearer*, or *order*, or *to the order of*, or to *cash*, when indorsed, are regarded as money. Any one having such checks should be careful not to lose them.

6. The drawer of any check may stop the payment of the check by notifying the bank before the payment is actually made.

7. If you want to assure the person to whom you send a check that you have enough money in the bank to pay the check, you may have the check **certified**. You take it to the bank and the cashier stamps "certified" across the face and signs his name.

If you have any blank checks at home, bring them to school. Write checks in payment of the various bills on the preceding pages.

Make a check book of several slips of paper. Do not forget to provide a stub for every check.

Pay the following bills with checks:

1. Your gas bill, $2.15, to the New York Gas Company.

2. Your electric light bill, $2.78, to the Electric Light Company.

3. Your club dues, $2, to one of your clubs.

4. Your magazine bill, $1.50, to the Framley Publishing Company.

5. Your doctor's bill, $5, to Dr. S. Anderson.

CASH AND PERSONAL ACCOUNTS

A **cash account** is a statement or record of money taken in and paid out. It has a column at the left for the date, and money columns at the right. The word "Cash" is written in the middle over the columns. Some accounts have the Receipts (Debtor — Dr.) on one side and the Payments (Creditor — Cr.) on the other side of the page. Others have the two columns together, alongside each other.

Here are specimen pages of cash accounts:

(*a*)

1921		*Cash*	*Dr.*		*Cr.*	
Jan.	1	Cash on hand	400	50		
	5	Cash received	20	20		
	6	Paid butcher			15	80
	8	Paid rent			85	00
		Balance on hand			319	90
			420	70	420	70
Jan.	8	Balance brought down	319	90		

(*b*)

1921		*Cash*	*Dr.*		*1921*			*Cr.*	
Jan.	1	Cash on hand	400	50	Jan.	6	Butcher	15	80
	5	Cash received	20	20		8	Rent	85	00
			420	70			Balance	319	90
Jan.	8	Balance	319	90				420	70

In most business houses cash accounts are usually kept in a separate book from other accounts, the left page being used for all receipts (debits) and the right page for all payments (credits).

[With pencil]

Write the following accounts, ruling your page properly, and balance each. Supply dates.

1. Receipts — Sale of newspapers, 60¢; running errands, 20¢; sale of magazines, 80¢; from father, $2.00.
 Payments — For newspapers, 35¢; for magazines, 50¢; for books, 40¢; for gloves, 45¢; for bat, 25¢.

2. Receipts — July 1: On hand, $2.10; errands, 30¢; sweeping store, 10¢; from father, $1.50; from mother, 50¢; from uncle, 25¢.
 Payments — Kites, 20¢; baseball, 25¢; bat, 25¢; candy, 15¢; Thrift Stamps, 50¢.

3. Receipts — Aug. 1: On hand, $1.60; picking berries, $.50; helping Farmer Smith, $1.80; errands, $1.10; allowance from father, $2.50.
 Payments — Candy, $1.50; theater, $1.00; carfares, $.30; Thrift Stamps, $1.00.

4. Imagine that you are treasurer of the School Athletic Association. Write the cash account for the following months:

March	Receipts	Cash on hand	$41.50
		Dues	$ 5.75
		Rental of field	$ 5.00
		Tickets to games	$12.50
	Payments	Printing	$ 6.00
		Commissions	$ 5.75
		Uniforms	$15.00
April	Receipts	Cash on hand	—
		Dues	$ 5.75
	Payments	Equipment	$ 6.50



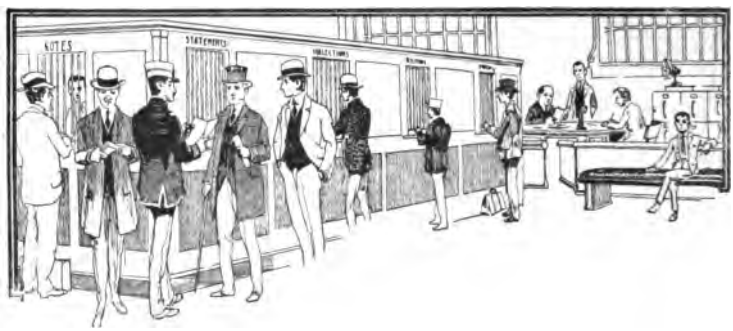
5. Imagine that you are the treasurer of the Perseverance Club. Write the cash account for the previous term. Supply your own dates, items, and figures. Some of the receipts are dues, donations, sales of tickets to festivals, etc. Some of the expenses are printing, refreshments, help, costumes, prizes, etc.

6. Imagine that at the beginning of this month there was $50 in the treasury. Write the cash account for the month:

Day			
1	Receipts —	Cash on hand	$50.00
8		Dues	$ 6.50
15		Entertainment	$22.80
21		Fair	$26.50
26		Donations	$ 3.50
2	Payments —	Rent	$ 5.00
6		Printing	$ 4.50
15		Costumes	$ 8.75
15		Help	$ 4.00
18		Printing	$ 2.50
21		Help	$ 3.50
21		Refreshments	$ 7.50
21		Rent	$ 5.00

7. Keep a cash account of your receipts and expenses for this week; for the month.

BANKS



An establishment authorized to receive, to lend, and to exchange money is called a **bank.**

If a person wants to use his money soon, he deposits it in a **bank of deposit** or a **business** or **commercial bank.** If he does not need the money for some time and does not expect to draw it out for some time, he usually deposits it in **a savings bank.**

Banks of Deposit

1. A bank of deposit allows a checking account instead of interest. The depositor has the privilege of drawing checks on the bank, ordering it to pay money up to the amount on deposit in the bank.

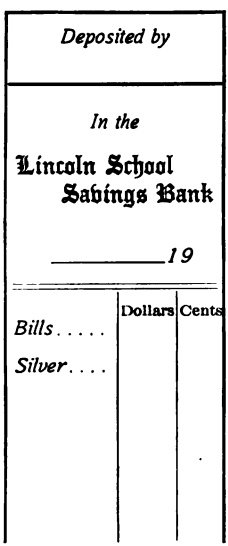
2. A bank of deposit receives deposits for safekeeping and lends money. It accepts checks for deposits and cashes checks.

Savings Banks

1. A savings bank pays interest on money deposited (usually on sums from $5 to $5000), for a time known as *interest term*, which may be 3 months or 6 months.
2. A savings bank as a rule accepts money for safekeeping and cashes checks of depositors only when presented with the pass book, or deposit book. Checks drawn by the depositor on other banks are usually accepted for deposit.

Many schools now have school savings banks. Most of these school banks deposit their funds (money) in some larger savings bank where they obtain interest on their deposits.

The following are illustrations of deposit slips of savings banks and of commercial banks. Every time money is deposited a slip like one of these must be filled out:



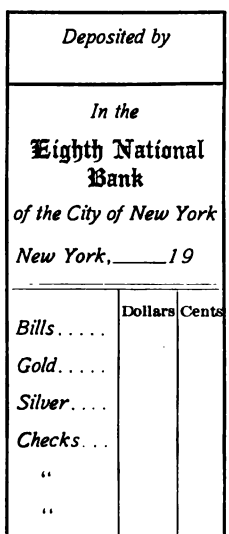
Deposited by

In the

Lincoln School Savings Bank

_____ *19*

	Dollars	Cents
Bills		
Silver		



Deposited by

In the

Eighth National Bank

of the City of New York

New York, _____ *19*

	Dollars	Cents
Bills		
Gold		
Silver		
Checks		
"		
"		



Deposited to the Credit of

_____ *19*

In

The First Exchange Bank

Please Omit All Dollar Signs

	Dollars	Cents
Gold		
Silver		
Bills		
Check on Bank		
"		
"		

Postal Savings Banks

The United States government has established a savings-bank system in the various post offices, whereby the savings of any person may be deposited at interest, with the security of the United States government. Any person 10 years of age or older may become a depositor in the **postal savings bank.**

The smallest amount that can be deposited is $1 and the greatest balance permitted, exclusive of interest, is $2500. Amounts less than $1 may be saved by purchasing 10-cent

postal savings cards and 10-cent postal savings stamps. A postal savings card with 9 postal savings stamps affixed will be accepted as a deposit of $1.

A depositor receives a postal savings certificate for every deposit made. These certificates are issued in denominations of $1, $2, $5, $10, $20, $50, $100, $200, and $500. Interest is allowed on these certificates at the rate of 2% a year. It begins on the first day of the month following the day the certificate was issued. No interest is allowed for any fraction of a year.

If a depositor desires to withdraw any money he must return savings certificates covering the amount wanted.

Visit the nearest post office and see how the postal savings bank is conducted. Join one yourself if you can afford to.

Every one should save as much as he possibly can. *Thrift* is an excellent habit.

1. Fill out deposit slips for the following deposits:

a. June 9 — $50 check, $45 check, $18 check, 10 five-dollar bills, 20 one-dollar bills.

b. June 16 — $25 check, $250 check, $48 check, $64 check, 5 ten-dollar bills, 8 five-dollar bills, 15 one-dollar bills.

2. What must you do to each check before depositing it?

3. Imagine that your teacher requests you to deposit the following in the First Exchange Bank to-day, in his name. Fill out the deposit slip:

20 dimes, 100 quarters, 12 one-dollar bills, 2 five-dollar bills, 1 ten-dollar bill, $10 check.

BUSY SEAT WORK



A. Perform the operations indicated within the time required by your teacher.

B. Make your own problems, based on each of the following examples.

Example: $3\frac{1}{8}-\frac{3}{4}$.

A strip of wood $3\frac{1}{8}''$ long was shortened by $\frac{3}{4}''$. How long was the remaining piece? [Use pencil when needed]

I.

1. $\frac{5}{6}+\frac{2}{3}$
2. $\frac{3}{8}+\frac{1}{3}$
3. $\frac{3}{4}+\frac{15}{16}$
4. $\frac{5}{8}+\frac{3}{4}$
5. $\frac{4}{5}+\frac{2}{3}$
6. $\frac{5}{12}+\frac{5}{6}$
7. $\frac{3}{8}+\frac{1}{6}$
8. $\frac{2}{3}+\frac{5}{8}$
9. $\frac{4}{5}+\frac{1}{4}$
10. $\frac{3}{8}+\frac{5}{16}$

II.

1. $\frac{1}{2}-\frac{5}{16}$
2. $1\frac{1}{2}-\frac{3}{4}$
3. $8-\frac{7}{9}$
4. $1\frac{1}{8}-\frac{3}{4}$
5. $\frac{7}{8}-\frac{1}{2}$
6. $\frac{7}{8}-\frac{3}{4}$
7. $2\frac{1}{4}-\frac{7}{8}$
8. $\frac{1}{2}-\frac{1}{10}$
9. $\frac{5}{6}-\frac{1}{2}$
10. $1\frac{1}{6}-\frac{2}{3}$

III.

1. $\frac{6}{7} \times \frac{1}{3}$
2. $\frac{5}{8} \times \frac{2}{15}$
3. $\frac{3}{8} \times \frac{5}{9}$
4. $\frac{8}{15}$ of $\frac{3}{4}$
5. $\frac{5}{12} \times \frac{3}{20}$
6. $2\frac{1}{2} \times \frac{6}{15}$
7. $\frac{9}{10}$ of $\frac{2}{3}$
8. $\frac{3}{8} \times \frac{4}{5}$
9. $1\frac{1}{2} \times \frac{3}{8}$
10. $\frac{5}{8} \times 3\frac{1}{5}$

IV.

1. $\frac{5}{12} \div \frac{1}{4}$
2. $7 \div \frac{1}{8}$
3. $\frac{3}{7} \div 21$
4. $50 \div \frac{10}{11}$
5. $5 \div 1\frac{1}{4}$
6. $4\frac{1}{6} \div 20$
7. $\frac{4}{5} \div \frac{8}{9}$
8. $\frac{6}{7} \div 3$
9. $\frac{7}{8} \div \frac{5}{6}$
10. $\frac{5}{16} \div 3\frac{3}{4}$

V.

1. .62+.3
2. 1.8+3.7
3. 9.9+5
4. .87+1.02
5. 6.63+.8
6. 3.5+6
7. .68+1.111
8. .098+.82
9. 7.5+1.002
10. 6.8+4

VI.

1. 5.3−.04
2. 12.6−7.8
3. 4.56−.56
4. 8.3−7.9
5. .36−.008
6. 9.9−4
7. 7.63−.8
8. 95.6−8.7
9. 62.7−9.08
10. 3.04−.76

VII.

1. .8×.04
2. 5.1×.2
3. 5×1.3
4. 2.4×.01
5. 1.1×1.2
6. 4.6×2
7. .04×.003
8. .6×.9
9. 6×.05
10. 4.2×.003

VIII.

1. $.08 \div 4$
2. $2.4 \div .08$
3. $6 \div .12$
4. $2.7 \div 9$
5. $.042 \div .7$
6. $.0045 \div .9$
7. $7.2 \div .006$
8. $.096 \div .8$
9. $5.6 \div .08$
10. $1.44 \div 1.2$

IX.

1. $\frac{1}{2} = —\%$
2. $\frac{1}{4} = —\%$
3. $\frac{4}{5} = —\%$
4. $\frac{5}{6} = —\%$
5. $\frac{3}{5} = —\%$
6. $\frac{1}{7} = —\%$
7. $\frac{3}{8} = —\%$
8. $\frac{3}{4} = —\%$
9. $\frac{1}{5} = —\%$
10. $\frac{1}{3} = —\%$

X.

1. $\frac{2}{3} = —\%$
2. $\frac{5}{8} = —\%$
3. $\frac{1}{8} = —\%$
4. $\frac{1}{25} = —\%$
5. $\frac{1}{20} = —\%$
6. $\frac{1}{40} = —\%$
7. $\frac{1}{50} = —\%$
8. $\frac{1}{12} = —\%$
9. $\frac{1}{16} = —\%$
10. $\frac{3}{25} = —\%$

A. Solve the following examples.

B. Make your own problems in percentage, profit and loss, discount, commission, and interest, based on the following examples.

XI. Find:

1. 8% of 60
2. 9% of 3000
3. 6% of 30
4. 2% of 400
5. $1\frac{1}{2}\%$ of 6000
6. 5% of 4
7. 12% of 400
8. $12\frac{1}{2}\%$ of 200
9. 1% of 7
10. 7% of 5

XII. Find the value of x:

1. $\frac{8}{9}x=72$
2. $2\frac{1}{2}x=35$
3. $.6\,x=36$
4. $\frac{4}{7}x=28$
5. $5\frac{1}{2}x=55$
6. $2.5\,x=50$
7. $\frac{3}{4}x=36$
8. $4\frac{1}{2}x=90$
9. $\frac{2}{5}x=20$
10. $3\frac{1}{2}x=49$

XIII. What per cent of

1. 54 is 18?
2. 64 is 32?
3. 49 is 28?
4. 60 is 35?
5. 63 is 18?
6. 35 is 14?
7. 55 is 33?
8. 96 is 32?
9. 72 is 42?
10. 56 is 42?

XIV. Find:

1. 25% of 84
2. $33\frac{1}{3}$% of 96
3. $66\frac{2}{3}$% of 48
4. 40% of 55
5. 75% of 32
6. $87\frac{1}{2}$% of 400
7. $83\frac{1}{3}$% of 66
8. $37\frac{1}{2}$% of 64
9. 50% of 36
10. $12\frac{1}{2}$% of 96

XV. Find the missing terms:

	Cost	Rate of Gain	Rate of Loss	Gain	Loss	Selling Price
1.	$200	—	8%	—	—	?
2.	$120	5%	—	—	—	?
3.	$400	—	—	?	—	$450
4.	?	8%	—	$ 16	—	?
5.	?	20%	—	?	—	$240
6.	?	—	10%	—	?	$270
7.	—	—	25%	—	$40	?
8.	—	?	—	$ 20	—	$ 60
9.	—	—	?	—	$30	$ 50
10.	$500	?	—	$600	—	—

XVI. Find the interest on:

1. $400 for 8 mo. at 4%
2. $600 for 90 da. at 6%
3. $500 for 2 mo. 10 da. at 5%
4. $1200 for 3 mo. 15 da. at 3%
5. $1000 for 4 mo. at 6%
6. $1500 for 6 mo. 15 da. at 4%
7. $2000 for 1 yr. 2 mo. at 3%
8. $3000 for 1 yr. 4 mo. 20 da. at 4%
9. $6000 from June 8 to Sept. 4 at 5%
10. $800 from March 19, 1919 to June 6, 1921 at 4%

XVII. Change:

1. 56 qt. to gallons
2. 46 da. to weeks
3. 49 oz. to pounds
4. 58 qt. to pecks
5. 75 min. to hours
6. 9 pk. 2 qt. to pecks
7. 6 gal. 2 qt. to gallons
8. 9 lb. 8 oz. to pounds
9. 5 qt. 1 pt. to pints
10. 2 lb. 3 oz. to ounces

XVIII. Change:

1. 40 m. to decimeters
2. 160 cm. to meters
3. 180 m. to kilometers
4. 24 Km. to meters
5. 15 dm. to meters
6. 6 Km. 4 Hm. 2 dm. to meters
7. 4 Km. to miles
8. 10 mi. to kilometers
9. 2 kilos to pounds
10. 22 lb. to kilograms

"Young Patriots"

In 1917 boys throughout the United States organized "Pig Clubs" and "Corn Clubs" to add to our food supplies. They enjoyed the work and profited financially thereby. [With pencil]



1. Walter Whitman of Indiana had a pig which weighed 297 lb. when six months old. On its eighth-month birthday, it weighed 456 lb. What was the gain? What was the average daily gain?

2. George Barker of Indiana bought a Duvoc pig weighing 58 lb. on June 8. Under his care the pig gained in weight so that it weighed 243 lb. on Sept. 10. Find the average daily gain in weight.

3. The total cost of raising the pig was 7.3¢ for each pound gained. Find the total cost of raising the pig.

4. On Sept. 20, the pig was sold for $46 and the profit made was $28. What per cent was gained?

5. The pig then weighed 266 lb. on the foot. After being dressed it weighed but 85% of this. How much did it weigh when dressed?

6. The butcher received 25¢ a pound for the pig. How much did he receive in all?

7. Robert White produced 140 bu. of corn on his acre of land, and sold it for $175, giving him a net profit of $150. Find his per cent of gain.

8. His brother, John White, raised 145 bu. of corn on his acre and sold all the corn for $185. If his profit was $160, what per cent did he gain?

FORTY-MINUTE TESTS

☞ *Read the example carefully. Note what is required. Check all work to test the correctness of your answers.*

I

[Without pencil]

1. $24+32, -2, \div 9, \times 12, -2, \div 7, \times \frac{1}{2} = ?$

2. What is the interest on \$600 for 2 yr. at $2\frac{1}{2}\%$?

3. An agent sold 80 desks at \$10 each and charged 3% commission. How much did he receive for his work?

4. If the list price of a piano was \$400 and the discount was 5%, what was the net price?

5. If gas cost 80¢ per 1000 cu. ft. and 2500 cu. ft. were used, what was the amount of the bill?

[With pencil]

6. Simplify: $\frac{1\frac{7}{8} \times 9\frac{1}{3}}{\frac{3}{5} \times 1\frac{5}{8}}$.

7. If 150 yd. of dress goods were bought @ \$1.75 and sold at an average profit of 40%, how much was gained by the transaction?

8. Mr. Jones sent his agent 200 bbl. of apples, 300 bbl. of potatoes, and 250 bbl. of cabbages. The agent sold the apples @ \$2.75, the potatoes @ \$1.50, and the cabbages @ \$.85.

a. Find the agent's commission at 5%.

b. Find how much Mr. Jones received.

9. Find the net cost of 120 bbl. of flour @ \$9.75, less discounts of 5% and 5%.

10. I lent $800 to Mr. F. on Aug. 15, 1919. The debt was paid with interest at 6% on July 9, 1920. What amount did I receive?

II

[Without pencil]

1. $2 \times 3\frac{1}{2}$, +8, +15, +6, ÷12, ×6 = what per cent of 24?

2. There are 40 pupils on register; 38 pupils are present. What per cent of the class are absent?

3. The selling price is $36; the loss is $12. What is the loss per cent?

4. An article that costs 35¢ is sold for 42¢. What per cent is gained?

5. 1 is what per cent of $2\frac{1}{2}$?

[With pencil]

6. $1000 is divided equally among 15 children. What per cent of the sum is given to each child?

7. A school has 750 boys and 650 girls enrolled. What per cent of the total register is the number of boys? the number of girls?

8. If an article costs $650, what per cent do I gain by selling it for $300 more than the cost?

9. Velour that costs $7.50 a yard is sold for $9.30 a yard. What per cent is gained?

10. By selling some silk for $15.50 I lose $1. What per cent do I lose?

III

[With pencil]

1. Add 87,653, 12,761, 30,508, 39,175, 42,078, and 66,779.

2. From 228,765 take 39,175.

3. $792 \times 125 = ?$

4. $\frac{11 \times 81 \times 26 \times 100}{39 \times 15 \times 90 \times 22} = ?$

5. One man weighed 280 lb.; another weighed 85% as much. Find the weight of both together.

6. Find the interest on \$6040 for 1 yr. 8 mo. at 4%.

7. A merchant sold goods that cost \$2180 at a gain of $33\frac{1}{3}\%$. How much was the gain?

8. Leather that cost \$1648 was sold at a loss of $12\frac{1}{2}\%$. What was the selling price?

9. An agent purchased rice for \$2840. What was his commission at $3\frac{1}{2}\%$?

10. A bill amounting to \$250 was discounted at $6\frac{1}{2}\%$. Find the net amount.

IV

[Without pencil]

1. Add $23+54+19+62$.

2. $.66\frac{2}{3}+\frac{1}{3} = ?$

3. A salesman received a salary of \$10 a week and $1\frac{1}{2}\%$ commission. If he sold \$600 worth of goods in a week, how much did he earn that week?

4. Butter costing 60¢ a pound was sold at 40% gain. Find the selling price.

5. I gained $66\frac{2}{3}\%$ or 2¢ in selling my pencil. How much did I pay for the pencil?

[With pencil]

6. Divide 193.6272 by 12.84.

7. I bought 120 yd. of cloth at \$1.75 a yard, less discounts of 10% and 5%. Find the net cost.

8. A salesman sold machines at $32 each, receiving 6% commission. He sold 10 machines the first week, 14 machines the second week, and 20 machines the third week. Find the total commission.

9. An agent earned $120 by selling a house at $2\frac{1}{2}\%$ commission. Find the selling price of the house.

10. A hat was sold for $4.40 at a gain of 25%. Find the cost.

V

[Without pencil]

1. What is the interest on $900 at 4% for 30 days?

2. Find $\frac{1}{8}\%$ of $9600.

3. A book has 240 pages. If I have read 80 pages, what per cent of the book have I read?

4. 15 is $16\frac{2}{3}\%$ of what number?

5. Find 150% of 30.

[With pencil]

6. Find the interest on $2600 at 4% for 2 yr. 3 mo. 18 da.

7. How many dollars can I get for 250 francs, at the approximate normal rate of exchange?

8. Find the net price when the list price is $2500 and the rates of discount are 5% and 2%.

9. Find the tax on property assessed at $5625 if the tax rate is $8\frac{1}{2}$ mills on $1.

10. A farm is sold for $4140, at a gain of 15%. Find the cost.

VI

[Without pencil]

1. 200% of 6, $\times 9$, -8, $\div 5$, $\times \frac{3}{4} = ?$

2. $.37\frac{1}{2} \times 256 = ?$

3. $.6 \div .15 = ?$

4. $.03 \times .029 = ?$

5. The area of a rectangle is 40 sq. ft.; the length is 8 ft. Find the width.

[With pencil]

6. The divisor is 704.009; the dividend is 12.76. Find the quotient (to three decimal places).

7. Which has the greater area, a rectangle whose base is 24 ft. and whose altitude is 15 ft., or a square with a base 20 ft. long?

8. Find the cost of a farm 120 rd. by 242 rd. at $100 an acre.

9. On Jan. 18 I borrow $750 with interest at 4%. For how much must I draw my check to settle on June 6?

10. By selling goods for $6.56 more than they cost, I gain 16%. Find the cost.

VII

[Without pencil]

1. $33\frac{1}{3}\%$ of 9, $\times 8$, $+3$, $\div 9$, $\times 10$, -5, $\div 5 = ?$

2. Reduce £3 4*s*. to shillings.

3. Express $5\frac{1}{2}\%$ as a common fraction.

4. An agent received $5 for collecting $100. What rate did he charge?

5. An agent received £3 4*s*. for some work. He exchanged the money for United States money. How much did he get? (Use the approximate normal values.)

[With pencil]

6. Reduce £5 4*s*. 2*d*. to pence.

7. Reduce £8 5*s*. 4*d*. to pounds.

8. Find the value of £6 8*s*. 3*d*. in United States money. (Use the approximate normal values.)

9. What is the amount to be collected on a sum of $8000 lent for 92 da. at 2½%?

10. An Englishman has £24 6*s*. 3*d*. when he lands here. He exchanges it for United States money. How much of our money does he receive? (Use the approximate normal values.)

VIII [With pencil]

1. Add: 95,675
80,170
19,787
95,068
49,632
47,819

2. Subtract: 7,265,432
3,514,767

3. 2045 × 76,543 = ?

4. 164,984 ÷ 328 = ?

5. Find the interest on $160 for 3 yr. 11 mo. 10 da. at 3%.

6. An agent receives $30 for selling goods for $240. What is his rate of commission?

7. Berries bought at $4.60 a bushel are sold at $5 a bushel. What is the gain per cent?

8. A bill of goods for $600 is discounted at 2½%. Find the net price.

9. Change £8 10*s*. to United States money. (Use the approximate normal values.)

10. What amount of English money can I get in exchange for $61? (Use the approximate normal value.)

IX [With pencil]

1. Change £3 5*s*. 6*d*. to pence.

2. Reduce £3 5*s*. 6*d*. to pounds.

3. Find the value of £3 5*s*. 6*d*. in dollars. (Use the approximate normal values.)

4. Express as common fractions: $2\frac{1}{2}\%$, $16\frac{2}{3}\%$, $4\frac{1}{2}\%$, $5\frac{1}{2}\%$.

5. Find the interest on \$7200 at $3\frac{1}{2}\%$ for 93 days.

6. A tourist arriving in Liverpool exchanged \$200 for English money. How much did he receive? (Use the approximate normal values.)

7. An agent received \$48 for collecting a bill of \$960. What rate of commission was he paid?

8. By selling ribbon at \$.25 a yard more than it cost him, a merchant gained $62\frac{1}{2}\%$. What was the cost per yard?

9. I lost \$75 when I sold my piano at 15% below cost. How much did it cost me?

10. What was my tax on a house assessed at \$4500, if the tax rate was 2.12%?

X

[With pencil]

1. Find the interest on \$750 for 2 yr. 3 mo. at 6%.

2. Find the interest on \$960 for 60 days at $3\frac{1}{2}\%$.

3. A picture that cost \$240 was sold at a loss of 35%. Find the loss.

4. A grocer bought 40 boxes of fruit at \$2.50 per box. He sold it at a gain of 33%. How much did he receive for all the fruit?

5. An agent sold a house for \$15,000 and charged $2\frac{1}{2}\%$ commission. Find his commission and the amount of money sent to the owner.

6. What was the net price of 30 books listed at \$3.50 each, if the discount was 40%?

7. Find the equivalent of £19 9*s*. 6*d*. in United States money. (Use the approximate normal values.)

8. Change to meters and add: 978.9 cm., 48.05 Hm., 42 Dm., 9 Km.

9. Express as common fractions: $37\frac{1}{2}\%$, 150%, $16\frac{2}{3}\%$, $\frac{1}{5}\%$.

10. Add crosswise: 923, 798, 47, 9645.

XI

[With pencil]

1. Write as decimals: $8\frac{1}{2}\%$, 25%, $\frac{1}{2}\%$, 5%, 200%, $\frac{4}{5}\%$, $5\frac{1}{2}\%$.

2. Divide the product of $4\frac{3}{5}$ and $1\frac{1}{2}$ by their difference.

3. After selling 25% of his goods, a merchant had 120 yd. left. How much did he have at first?

4. One day 1500 people bought tickets for a certain theater; 48% of them paid \$2 each, 26% paid \$1 each, the remainder paid \$.80 each. Find the total amount of money paid for the tickets, including a war tax of 10%.

5. Write the answers at sight:

a. $\frac{1}{2}$ of $12\frac{3}{4} = ?$ *b.* $\frac{1}{3}$ of $6\frac{3}{5} = ?$

6. *a.* If 2000 rulers cost \$8, what was the cost of 1 ruler?

b. 500 is what per cent of 400?

7. How much greater is a 30% discount on \$2700 than a discount of 20% and 10%?

8. *a.* Gaston weighed 42 Kg. How many pounds did he weigh?

b. How many kilograms did John weigh if he weighed 111 lb.?

9. An Italian arrived with 287 lire in his pocket, and a Russian with 126 rubles. Who had more, and how much more, at the approximate normal rate of exchange?

10. On Sept. 14, 1920, a man borrowed \$500 at 4%. How much must he return on July 8, 1921, to cancel the debt?

XII

[With pencil]

1. Find the interest on \$196 for 1 yr. 7 mo. 24 da. at 6%.

2. Find the equivalent of £5 14*s*. in United States money. (Use the approximate normal values.)

3. I bought an overcoat in England for \$50. How much in English money did I pay for it?

4. A building was 120 m. high. How many feet high was it?

5. The same building had a frontage of 200 ft. How many meters wide was it?

6. Find the equivalent of 550 marks in United States money. (Use the approximate normal value.)

7. What per cent was gained by buying goods for \$210 and selling them at \$245?

8. If a real estate agent charged \$2.50 for renting a house at \$62.50 per month, what was his rate of commission?

9. Add $\frac{19}{30}$, $\frac{14}{15}$, $6\frac{3}{4}$, and $\frac{17}{20}$.

10. Find the net price and the total discount on a bill of \$840, the discounts being 20%, 10%, 3%.

XIII

[With pencil]

1. Find the interest and the amount on \$800 from Jan. 5, 1920 to Nov. 26, 1921, at 4%.

2. I sold a piano for \$255 and lost 15%. Find the cost.

3. Simplify: $\dfrac{25\frac{1}{6} \div 2}{16\frac{1}{6} - 14\frac{1}{10}}$.

4. How many half-pint bottles can be filled from a jar containing 16 liters of cologne?

5. If 200 bbl. of apples were sold for \$1080 at a gain of 8%, what was the cost per barrel?

6. My bill at a French hotel was 6 francs 50 centimes a day. State in United States money the amount I paid for my six days' stay. (Use the approximate normal values.)

7. In 1911 a tourist went to Paris with $500. When he had this sum exchanged for francs, how much did he receive? (Use the approximate normal value.)

8. At $2 a meter, find the cost of 400 yd. of silk. (Use 1 m.=39 in.)

9. A baseball team won 52 games and lost 18 games. What was the per cent of games won?

10. A coal dealer bought coal at $10.50 a ton. He sold it at $.35 a pail. What per cent did he make if he got 40 pailfuls from each ton?

XIV

[With pencil]

1. If 350 toys were made at a cost of 60¢ each and were sold at a gain of 15%, how much was received for the toys?

2. How much must I pay for a piano listed at $960 if discounts of 40% and 15% are allowed?

3. If the rate of taxation is $8\frac{1}{2}$ mills on the dollar, what tax must be paid on property assessed at $64,000?

4. What interest must be paid for the use of $480 for 1 yr. 1 mo. 20 da. at $4\frac{1}{2}\%$?

5. On Sept. 14, 1920, a man borrowed $500 at 4%. How much must he return to cancel the debt on July 8, 1922?

6. A commission merchant sold goods at a commission of $6\frac{1}{2}\%$. What commission did he earn on the sale of 3600 cans of peas at $1.50 a dozen?

7. An agent received $95.40 as his commission for selling an automobile. If the rate of his commission was 4%, what was the selling price of the automobile?

8. *a.* A French boy was 1 m. 60 cm. tall. How tall was he according to our system of measurement?

b. A boy ran a race of 100 yd. How many meters did he run?

9. I sent a money order to London for $50. How much was it worth in English money? (Use the approximate normal value.)

10. *a.* $591.8 \times .85 = ?$ *b.* $\frac{39 \times 144 \times 49 \times 36}{156 \times 56 \times 27} = ?$

XV

[With pencil]

1. Add 247.006, 3,947.0308, 506.0086, 949.3897, and 8004.6.
2. Divide 11,636.784 by 24.6.
3. Multiply 46.007 by 3.8.
4. Divide the sum of 2.1 and 1.05 by 6.3.
5. Divide ($\frac{3}{5}$ plus $1\frac{2}{3}$) by $\frac{5}{7}$.
6. Work the following by the shortest methods you know:

a. Find the cost of 34,000 bricks at $10 per M.

b. Find the cost of 18,000 envelopes at $1.50 per C.

c. Find the cost of 6 doz. cans of tomatoes at $1.37\frac{1}{2}$ per doz.

d. Divide 8126 by 600.

e. At $465 per hundred, how much will 25 cost?

7. The population of a certain town in 1910 was 200,500. In 1920 it was 529,320. Find the per cent of increase.

8. John and Louis had been skating the same length of time. They wished to know which had gone farther. John said he had skated 8 mi., and Louis, 6 Km. Which had covered more miles, and how many more?

9. A dealer bought 480 lb. of coffee at 25¢ a pound. How much must he pay if he receives discounts of 20% and 10%?

10. If the rate of taxation was $4\frac{1}{2}$ mills, what tax did a man pay whose property was assessed at $100,000?

XVI

[Without pencil]

1. $18+23, -9, \times\frac{1}{8}, \times 15, \div 12, \times 10{,}000 = ?$
2. Add $\frac{1}{2}$ and $\frac{3}{4}$.
3. Multiply .3 by 9 thousandths.
4. Find the interest on $240 for 3 mo. at 6%.
5. What does a liter equal in our measures?

[With pencil]

6. Write a check made out by yourself to a friend and tell how your friend would indorse it.
7. Find the net price of 15 reams of notepaper at $1.25 each and 25 reams of letter paper at $1.75, with 30% and $12\frac{1}{2}$% off.
8. Find the interest on $2862 for 93 days at 6%.
9. A collector charged a commission of $3\frac{1}{2}$%. If he collected 95% of a debt of $2148, what sum should he send to his employer?
10. A collector charged 3% for collecting bills. In one month he earned $345. How much did he collect?

XVII

[Without pencil]

1. How much is 100% of $896?
2. Change $3\frac{1}{2}$% to a common fraction.
3. At $\$1\frac{1}{2}$ each, how many books can be bought for $18?
4. Multiply 8.008 by 100.
5. Divide 12.0006 by 1000.
6. If 1 doz. eggs cost 45¢, find the cost of 72 eggs.

7. I bought an article for \$12 and sold it for \$15. Find the gain per cent.

8. I bought an article for \$15 and sold it for \$12. Find the loss per cent.

9. If I sold an article for 3 times its cost, what was the gain per cent?

10. If I borrowed money on July 8 and returned it on Sept. 15, how long did I keep it?

XVIII

[With pencil]

1. What is the interest on \$200 for 2 yr. 6 mo. at 6%?

2. What sum will settle a debt of \$400 for 1 yr. 3 mo. at 4%?

3. What is the interest on \$875 for 60 da. at 6%?

4. How much must I pay for a piano listed at \$400 if I am allowed a discount of 20% for cash?

5. What single discount is equal to the discounts 30% and 10%?

6. An agent collects $66\frac{2}{3}\%$ of a debt of \$120 and charges 2% commission. What is his commission?

7. An agent charges $12\frac{1}{2}\%$ commission for selling goods to the amount of \$56. How much does the owner receive after the commission is deducted?

8. An agent receives \$25 for selling 100 bbl. at \$5 a barrel. What is the rate of commission?

9. I have 36 m. of silk. How many yards have I?

10. How many inches are there in 10 m.?

XIX

[With pencil]

1. Find the exact number of days from July 7 to Dec. 2.

2. What is the interest on \$1080 for 1 yr. 6 mo. 3 da. at 4%?

3. What sum will settle a debt of $450 for 1 yr. 4 mo. 12 da. at 5%?

4. How much was paid for 560 lb. of coffee at 30¢ a pound, less a discount of 5%?

5. 100 m. are how many inches longer than 100 yd.?

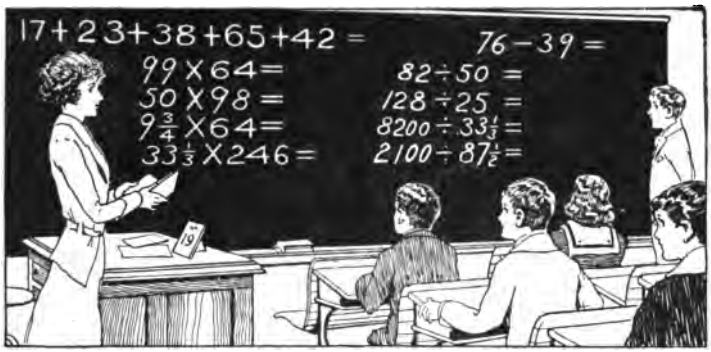
6. A man bought 1000 books at $.25 each and sold them all for $300. Find the gain or loss per cent.

7. An agent sold 540 bbl. of flour at $9.50 each. What was his commission, at 3%?

8. If an agent sold $4500 worth of goods and sent $4365 to the owner, what rate of commission did he charge?

9. An agent sold goods for $5000 and kept 5% commission. How much did he remit to his employer?

10. How much did a dealer pay in all for 300 yd. of carpet at 1\frac{1}{2}$ a yard, if the buyer's commission was 2%?



SEVENTH YEAR — SECOND HALF

SHORT METHODS IN FUNDAMENTAL OPERATIONS

The business man demands *accuracy* and *reasonable speed.* The only answer accepted is the *correct answer.* Therefore it is necessary, first of all, to be *accurate,* although speed is also important.

Time may often be saved by using short methods. The following are some of the short methods commonly used in business. Try to master them and to apply them whenever possible. Use them daily to develop skill in their application, since short methods will not be useful to you unless they enable you to do your work correctly in a shorter time.

Addition and Subtraction

Example: Add the following, without using a pencil:

	Work
17	Say:
23	42+5+60+8+30+3+20+7+10=185, *Ans.*
38	Or, 42+60+5+30+8+20+3+10+7=185, *Ans.*
65	
42	

1. Add: [Without pencil]

	a	*b*	*c*	*d*	*e*
	16	36	29	78	63
	24	24	32	16	27
	37	75	64	29	45
	48	42	18	42	19
	92	64	26	12	36
	19	87	15	38	21

Add:

	a	*b*
2.	26, 18, 17, 35, 48, and 52.	15, 28, 63, 59, 27, and 44.
3.	19, 38, 46, 54, 29, and 37.	49, 70, 85, 45, 76, and 66.
4.	54, 36, 79, 92, 89, and 16.	38, 61, 94, 67, 53, and 89.
5.	48, 57, 63, 19, 48, and 35.	74, 52, 73, 89, 42, and 52.
6.	83, 76, 64, 59, 43, and 38.	67, 43, 62, 98, 83, and 74.

Example: Subtract 39 from 76, without using a pencil.

WORK

Say: 76−30=46; 46− 9=37, *Ans.*
Or, 76− 9=67; 67−30=37, *Ans.*

Subtract, giving the answers immediately: [Without pencil]

	a	*b*	*c*	*d*	*e*
1.	67	45	34	75	54
	38	27	16	28	26
2.	92	83	32	56	63
	45	57	16	37	35
3.	100	100	100	100	100
	27	48	56	35	64

Multiplication

Multiplying by 10, *or by any multiple of* 10.

To multiply a number by 10, move the decimal point one place to the right; to multiply a number by 100, move the decimal point two places to the right; and so on.

Thus, $10\times65.=65/0.$ $100\times65.=65/00.$

Give the products: [Without pencil]

	a	*b*	*c*
1.	10×85	1000×87	1000×76
2.	10×695	100×915	100×99
3.	10×384	10×876	100×50
4.	100×756	100×575	1000×20
5.	100×92	10×196	1000×80
6.	10×6.7	100×16.08	$1000\times.06$
7.	100×7.8	10×29.075	1000×1.08
8.	100×9.6	100×3.5	$10\times.007$
9.	10×12.5	1000×6.07	$100\times.095$
10.	100×3.08	10×18.25	$1000\times.6$

Example: Multiply 56 by 200.

$200\times56=2\times5600=11{,}200$, *Ans.*

Give the products quickly: [Without pencil]

	a	*b*	*c*
1.	20×87	200×48	300×78
2.	200×56	400×150	200×54
3.	2000×45	300×250	600×72
4.	20×180	500×160	2000×36
5.	300×125	600×120	4000×92

Examples: Multiply (*a*) 65 by 99; (*b*) 58 by 98; (*c*) 27 by 19; (*d*) 64 by 101; (*e*) 38 by 21.

WORK

(*a*) $99\times65=(100\times65)-65=6500-65=6435$, *Ans.*
(*b*) $98\times58=5800-(2\times58)=5800-116=5684$, *Ans.*
(*c*) $19\times27=(20\times27)-27=540-27=513$, *Ans.*
(*d*) $101\times64=6400+64=6464$, *Ans.*
(*e*) $21\times38=(20\times38)+38=760+38=798$, *Ans.*

Multiply, using short methods: [Use pencil when needed]

	a	*b*	*c*
1.	127 by 98	274 by 98	18 by 18
2.	175 by 99	678 by 19	150 by 79
3.	165 by 49	376 by 99	763 by 98
4.	156 by 21	482 by 18	1275 by 102

Examples: Multiply (*a*) 98 by 50; (*b*) 64 by 25; (*c*) 72 by 75; (*d*) 160 by 125; (*e*) 182 by 150; (*f*) 84 by 250; (*g*) 28 by 5; (*h*) 64 by 15; (*i*) 125 by 500; (*j*) 65 by 20.

WORK

(*a*) $50\times 98=\frac{1}{2}$ of $100\times 98=4900$, *Ans.*
(*b*) $25\times 64=\frac{1}{4}$ of $100\times 64=1600$, *Ans.*
(*c*) $75\times 72=\frac{3}{4}$ of $100\times 72=5400$; or, $7200-\frac{1}{4}$ of $7200=5400$, *Ans.*
(*d*) $125\times160=\frac{1}{8}$ of $1000\times160=20{,}000$, *Ans.*
(*e*) $150\times182=1\frac{1}{2}\times18{,}200=27{,}300$, *Ans.*
(*f*) $250\times 84=\frac{1}{4}$ of $1000\times84=21{,}000$, *Ans.*
(*g*) $5\times 28=\frac{1}{2}$ of $10\times28=140$, *Ans.*
(*h*) $15\times 64=10\times64+\frac{1}{2}$ of $10\times64=960$, *Ans.*
(*i*) $500\times125=\frac{1}{8}$ of $1000\times125=62{,}500$, *Ans.*
(*j*) $20\times 65=\frac{1}{3}$ of $6500=1300$, *Ans.*

Multiply, using short methods: [Use pencil when needed]

	a	*b*	*c*	*d*
1.	25×872	50×186	15×752	150×168
2.	500×792	75×124	125×248	250×76
3.	50×764	25×328	15×83	150×162
4.	75×184	25×295	20×85	50×75

5. Multiply 486 by 25; by 75; by 5; by 50; by 150; by 250; by 15; by 20; by 125; by 500.

Examples: Multiply (*a*) 64 by $9\frac{3}{4}$; (*b*) 128 by $\frac{7}{8}$; (*c*) 56 by $87\frac{1}{2}$; (*d*) 140 by $37\frac{1}{2}$; (*e*) 246 by $33\frac{1}{3}$.

WORK

(*a*) $9\frac{3}{4}\times 64=(10\times64)-(\frac{1}{4}\text{ of }64)=640-16=624$, *Ans.*
(*b*) $\frac{7}{8}\times128=128-(\frac{1}{8}\text{ of }128)=128-16=112$, *Ans.*
(*c*) $87\frac{1}{2}\times 56=\frac{7}{8}\text{ of }100\times56=5600-\frac{1}{8}\text{ of }5600=5600-700=4900$, *Ans.*
(*d*) $37\frac{1}{2}\times140=\frac{3}{8}\text{ of }14{,}000=\frac{42000}{8}=5250$, *Ans.*
(*e*) $33\frac{1}{3}\times246=\frac{1}{3}\text{ of }24{,}600=8200$, *Ans.*

Find the products, using short methods:

[Use pencil when needed]

	a	*b*	*c*	*d*
1.	$62\frac{1}{2}\times168$	$9\frac{3}{4}\times36$	$9\frac{7}{8}\times48$	$9\frac{5}{6}\times180$
2.	$12\frac{1}{2}\times72$	$66\frac{2}{3}\times96$	$9\frac{4}{5}\times45$	$37\frac{1}{2}\times240$
3.	1000×1.06	50×38.4	150×168.2	$9\frac{3}{4}\times384$
4.	19×276	98×846	20×375	$87\frac{1}{2}\times768$
5.	15×392	75×248	25×424	21×76
6.	$9\frac{7}{8}\times144$	84×250	500×3.75	99×165
7.	$19\frac{3}{4}\times320$	25×1.08	$12\frac{1}{2}\times728$	125×160

Division

Dividing by 10, *or by any multiple of* 10.

To divide a number by 10, move the decimal point one place to the left; to divide by 100, move the decimal point two places to the left, and so on.

Thus, $87.\div10=8.7/=8.7$ $562.\div100=5.62/=5.62$

Give the quotients quickly: [Without pencil]

	a	*b*	*c*	*d*
1.	$62 \div 10$	$875 \div 100$	$387 \div 1000$	$5.62 \div 10$
2.	$38.2 \div 10$	$9.27 \div 10$	$4.87 \div 100$	$6.81 \div 100$

Examples: Divide (*a*) 82 by 50; (*b*) 128 by 25; (*c*) 1754 by 250; (*d*) 1628 by 500; (*e*) 152 by 125; (*f*) 8200 by $.33\frac{1}{3}$; (*g*) 8200 by $33\frac{1}{3}$; (*h*) 2100 by $.87\frac{1}{2}$; (*i*) 2100 by $87\frac{1}{2}$.

WORK

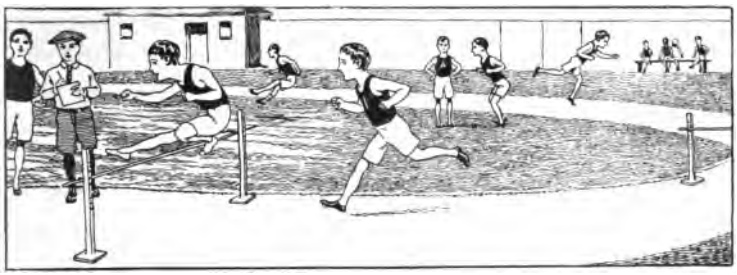
(*a*) $82 \div 50 = 82 \div (\frac{1}{2}$ of $100) = 2 \times .82 = 1.64$, *Ans.*
(*b*) $128 \div 25 = 128 \div \frac{100}{4} = 4 \times 1.28 = 5.12$, *Ans.*
(*c*) $1754 \div 250 = 1754 \div \frac{1000}{4} = 4 \times 1.754 = 7.016$, *Ans.*
(*d*) $1628 \div 500 = 1628 \div \frac{1000}{2} = 2 \times 1.628 = 3.256$, *Ans.*
(*e*) $152 \div 125 = 152 \div \frac{1000}{8} = 8 \times .152 = 1.216$, *Ans.*
(*f*) $8200 \div .33\frac{1}{3} = 8200 \div \frac{1}{3} = 3 \times 8200 = 24{,}600$, *Ans.*
(*g*) $8200 \div 33\frac{1}{3} = 8200 \div (100 \times \frac{1}{3}) = 3 \times 82.00 = 246$, *Ans.*
(*h*) $2100 \div .87\frac{1}{2} = 2100 \div \frac{7}{8} = 2100 \times \frac{8}{7} = 2400$, *Ans.*
(*i*) $2100 \div 87\frac{1}{2} = 2100 \div (100 \times \frac{7}{8}) = 21 \times \frac{8}{7} = 24$, *Ans.*

Divide, using short methods: [Use pencil when needed]

	a	*b*	*c*	*d*
1.	3765 by 50	8275 by 25	1762 by 500	2815 by 125
2.	3764 by 25	8216 by 50	3169 by 25	1824 by 125
3.	1628 by 50	1876 by 250	1918 by 500	2964 by 25

Find the quotients, using the shortest methods:

	a	*b*	*c*	*d*
4.	$16 \div .25$	$12 \div .12\frac{1}{2}$	$40 \div .62\frac{1}{2}$	$24 \div 75$
5.	$21 \div .87\frac{1}{2}$	$80 \div 25$	$365 \div 50$	$18 \div .25$
6.	$90 \div .75$	$120 \div .37\frac{1}{2}$	$600 \div .75$	$600 \div 37\frac{1}{2}$
7.	$80 \div .66\frac{2}{3}$	$180 \div .33\frac{1}{3}$	$200 \div .12\frac{1}{2}$	$900 \div 33\frac{1}{3}$



Short Methods Games

Prepare examples like the following, and play such games as "Scaling the Ladder" or "Scaling the Wall," "Baseball," "Obstacle Race," "Mountain Climbing," etc.

Ask your teacher to arrange the class in rows or teams. The teacher or the captains of the teams may prepare the examples. The winning team is the one that has the greatest number of correct answers in the given time.

1. Scaling the Ladder. See who can climb to the top of the ladder most quickly. A wrong answer means a fall. Write answers only.



a. $82+56+37$	*l.* 99×72
b. $100-36$	*m.* 25×64
c. 100×76.5	*n.* 150×36
d. $8.6\div1000$	*o.* 75×84
e. 200×45	*p.* $37\frac{1}{2}\times64$
f. $300-68$	*q.* $66\div.37\frac{1}{2}$
g. $56+73+89$	*r.* $66\div.33\frac{1}{3}$
h. 20×50	*s.* $56\div.87\frac{1}{2}$
i. $400\div20$	*t.* $90\div3\frac{1}{3}$
j. $4.4\div100$	*u.* $3\frac{1}{3}\times90$
k. 4.4×100	*v.* $.66\frac{2}{3}\times90$

2. Baseball. See which team scores the most runs. The class may be divided into two teams, A and B. When team A is at bat, each member must answer the question dictated by the teacher or some one else. Every correct answer is a "run." A wrong answer means that the team is "retired" and the other team then goes to bat. Keep the score by innings. The captains may prepare sets of examples like the following:



a. $36+58+37+59$
b. 1000×7.6
c. $.56\div100$
d. 200×7.5
e. $62\frac{1}{2}\times160$
f. $33\frac{1}{3}\times96$
g. $82\div50$
h. $.12\frac{1}{2}\times32$
i. $36\div.75$
j. 15×24

3. Obstacle Race. See who runs fastest. A wrong answer means a fall. The team having the greatest number of correct answers when time is called or when the race is over is the winning team. The teacher or captains may prepare obstacles similar to the following:



a. $87\div10$
b. 25×72
c. 125×844
d. 20×75
e. $87\frac{1}{2}\times160$
f. $66\frac{2}{3}\times96$
g. 250×364
h. 500×1284
i. $9\frac{3}{4}\times36$
j. $3.6\div1000$

EQUATIONS — REVIEW

(See the chapter on Equations, pages 44–48.)

[Without pencil]

1. What is an equation?

2. What are the parts of an equation called?

3. In the equation $6x+9=15$, what is $6x$ called? What is 15 called?

4. To what may an equation be compared?

5. What is the effect of multiplying or dividing both numbers of an equation by the same number?

Solve these equations:

	a	*b*	*c*
6.	$4x=12$	$6x=18$	$15x=30$
7.	$\frac{7}{8}x=14$	$12x=6$	$1\frac{1}{4}x=20$
8.	$.6x=24$	$.5x=1.5$	$.8x=1.6$
9.	$.75n=12$	$.09n=2.7$	$.006n=2.4$
10.	$.012n=3.6$	$.02x=12$	$\frac{3}{8}x=21$

Find the value of the unknown quantity:

11.	$x+6=24$	$y+12=60$	$16=n-6$
12.	$3x+12=33$	$5n-4=26$	$\frac{1}{3}x+5=8$
13.	$2x+10=48$	$\frac{3}{5}n+6=12$	$\frac{2}{3}n+3=15$
14.	$3x+5=20$	$\frac{3}{4}y+4=34$	$\frac{3}{4}x+4=31$
15.	$4x+6=30$	$\frac{3}{8}x+5=41$	$\frac{1}{8}x+6=30$

Solve: [With pencil]

	a	*b*
1.	$250x = 196$	$2.5n + 45 = 95$
2.	$3\frac{3}{4}x = \$45.15$	$2.3n = \$316.02$
3.	75% of $n = \$180.30$	$.016n = \$32.48$
4.	$2\frac{1}{3}x + 24 = 45$	35% of $x = \$1050$
5.	350% of $x = \$7.35$	$5.5n = \$22$

6. Write the equation for this problem: "What number increased by 24 equals 70?"

7. If $\frac{2}{3}$ of the class register was 30 pupils, what was the total register?

8. The number of Victory Juniors in our school was 2340. This was 7 times the number of our Victory Boys, plus 9. How many Victory Boys were there?

9. If $6\frac{1}{4}$ yd. of silk cost \$12.50, what was the cost of 1 yd.?

10. After spending $\frac{3}{5}$ of his money for Thrift Stamps, Frank had \$5.50 left. How much had he at first?

11. What number divided by 14 equals 112?

12. What number divided by 2, and then increased by 6, equals 15?

13. What number increased by 3.5 of itself equals 24?

14. If $\frac{2}{7}$ of the class were absent on Friday and 30 pupils were present, how many pupils were absent?

15. The sum of two numbers is 42. One number is 6 greater than the other. Find the two numbers.

16. If $3\frac{3}{4}$ yd. of gingham cost \$1.35, what was the cost per yard?

FOREIGN MONEY — REVIEW

(See the chapter on Foreign Money, pages 74–80.)

1. In what countries is the franc used?

2. What is the equivalent of the franc in United States money at the normal rate of exchange? at the market rate?

3. Name another coin having the same value at the normal rate of exchange.

4. Name the foreign coin approximately equal to \$5; to \$.20; to \$.25; to \$.50.

5. Name one country where each of these coins is used.

6. Give the approximate value in United States money of a penny; of 50 pfennigs; of a shilling; of 50 centimes.

Unless otherwise directed, always give the approximate value at the normal rate of exchange.

Give the approximate value of:

	a	*b*
7.	\$.50 in English money.	\$.10 in English money.
8.	\$5 in French money.	\$10 in English money.
9.	\$10 in Russian money.	\$2 in German money.
10.	\$10 in Italian money.	\$3 in French money.
11.	\$1 in Swiss money.	1000 marks in United States money.

12. Give the value in United States money of the following as reported in yesterday's newspaper: a franc, a mark, a pound sterling, a ruble.

13. Give the table of English money.

14. Anna sent her brother, who was in the American Expeditionary Force, a money order for $10 for Christmas. How much did he get for it in Paris? How much could he get for it in London? (Use the approximate normal value.)

15. Corporal Lane managed to save 40 francs a month while in the A. E. F. How many dollars did he save during his 6 months' stay in France?

16. On Dec. 5, 1918, the newspapers reported that an ordinary suit of clothes cost 1000 marks in Germany. How many dollars was that at the normal rate?

17. Private Duffy received $40 for Christmas and exchanged it for English money. What was the largest number of pounds he could get for it? the largest number of shillings?

18. Salvatore sent his mother in Italy $15 every month. How many lire did she get for this amount?

19. His brother Pietro arrived in New York in 1920 with 1500 lire. How many dollars was he able to get for them, if a lira was then worth 9¢?

20. Marshal Haig was rewarded by Parliament with a grant of £100,000. How many dollars is that?

21. A tourist spent £60 15*s*. during his stay in England, 1250 francs while in France, and 1000 lire while in Italy. How many dollars and cents did he spend?

22. In 1918 butter cost 40 francs a kilo in the war region of France. How much was that per kilo in our money? per pound?

23. Sugar cost 25 francs per kilo. What was the cost in United States money per kilo? per pound?

PERCENTAGE — REVIEW

(See the chapter on Percentage, pages 81–109.)

1. What is meant by per cent?

2. How many per cent are there in any unit? in half a unit? in a quarter of a unit? in a third of a unit? in four fifths of a unit?

3. Read as per cents: $\frac{27}{100}$, $\frac{3}{100}$, $\frac{8\frac{1}{2}}{100}$, $\frac{650}{100}$.

4. Read as per cents: .25, .06, .125, .04$\frac{1}{2}$, .160, .005, .003, 6.5, 8.

5. Read or write as decimals: 4%, 6$\frac{3}{4}$%, 20%, $\frac{1}{8}$%, 240%, $\frac{7}{8}$%, 750%.

6. Write each of these in two other ways: $\frac{6}{100}$, 18%, .07, 65%, 3$\frac{1}{8}$%, 450%, .8, 4.5.

7. What are the terms used in percentage?

8. Name the terms given and required in the following example: "Amy had \$12 and spent 20% of it. How much did she spend?"

9. How many per cent are there in the base?

10. How do you find the percentage?

State the shortest way of finding:

	a	*b*
11.	10% of a number	75% of a number
12.	5% of a number	150% of a number
13.	50% of a number	200% of a number
14.	25% of a number	125% of a number
15.	20% of a number	$\frac{1}{4}$% of a number

Find in the shortest way:

	a	*b*
16.	5% of \$500	250% of \$400
17.	10% of \$765	$1\frac{1}{2}$% of \$600
18.	15% of \$260	$62\frac{1}{2}$% of \$800
19.	50% of \$780	$87\frac{1}{2}$% of \$400
20.	$\frac{1}{4}$% of \$600	$\frac{1}{5}$% of \$200

21. How do you change any common fraction to a per cent?

22. Express as per cents: $\frac{18}{24}$, $\frac{12}{15}$, $\frac{18}{12}$, $\frac{18}{16}$, $\frac{30}{75}$.

What per cent of:

	a	*b*
23.	20 is 15?	$\frac{5}{12}$ is $\frac{3}{4}$?
24.	20 is 30?	$\frac{1}{2}$ is $\frac{3}{10}$?
25.	16 is 24?	$\frac{2}{3}$ is $\frac{8}{9}$?
26.	$\frac{3}{4}$ is $\frac{1}{4}$?	2 is $1\frac{1}{2}$?
27.	$\frac{4}{5}$ is $\frac{3}{10}$?	9 is $2\frac{1}{4}$?
28.	.6 is .4?	12 is .6?
29.	8 is .4?	.06 is .2?

30. How many per cent of a number is the number plus 20% of itself?

31. How many per cent of a number is the number increased by 15% of itself?

32. How many per cent of a number is the number diminished by 12% of itself?

33. How many per cent of a number is twice the number increased by one half the number?

34. How many per cent of a number is twice the number diminished by one fourth the number?

PROBLEMS

(If you do not know how to solve any of these problems, refer to the solutions on pages 83–106.)

☞ *Remember that correct answers are required.*

Before you attempt to solve a problem, *read* it very carefully and note what is *required* and what is *given*.

Before you drop your pencil, check all calculations to insure accuracy.

[Use pencil when needed]

1. There were 2500 pupils in the Manhattan School; 30% of them were in the seventh-year and eighth-year classes. How many pupils were there in the seventh-year and eighth-year classes?

2. If 20% of the pupils in the Fulton School were in the fifth-year and sixth-year classes and if there were 500 pupils in these two classes, how many pupils were there on register in this school?

3. There were 250 Victory Boys and 200 Victory Girls in the Farragut School in December, 1918. If the school register was 2500 that month, what per cent of the school were Victory pupils?

4. If 84% of the pupils in the Franklin School, having a register of 2450 pupils, were promoted, how many pupils were promoted?

5. The register of the seventh grade was 160; of these, 24 were not promoted. What per cent of the grade were promoted?

6. The price of a certain article costing \$.32 in 1918 increased 150% in 1920. What was the 1920 price?

7. An agent was paid $\frac{3}{8}$% of the sales he made. If his sales amounted to \$40,000 one week, what was his pay for that week?

8. What is the difference between $\frac{1}{5}$ of \$300 and $\frac{1}{5}\%$ of \$300?

9. Directly after the World War our family's living expenses were \$240 per month, which was 40% more than they had been before the war. What were our monthly living expenses before the war?

10. Certain property bought fifty years ago for \$5000 is now worth 950% as much. How much is it now worth?

11. A candler found that 87.5% of the 450 doz. eggs he inspected were good. How many eggs were good?

12. The Giants won 63.6% of the 154 games they played one year when they won the pennant. How many games did they win? (Count more than half a game a whole game.)

13. What is the difference between $\frac{3}{4}\%$ of \$640 and 75% of \$640?

14. The Emerson School sent \$625 to the Junior Red Cross Fund one year. Of this amount \$125 was obtained through the sale of articles made by the children. The rest was contributed by the children themselves. What per cent of all was given by the children?

15. On graduation day there were 300 pupils assembled. 125 of them owned War Stamps and 95 of them were Victory children. What per cent of all owned War Stamps? What per cent of all were Victory children?

16. Our school team won 15 games and lost 12 games. What per cent of the games played did they win?

17. If Mr. Lewis paid \$141 in settlement of a bill of \$150, what per cent discount was he allowed?

18. A man earning \$3500 a year managed to save \$770 a year. What per cent of his salary did he save?

19. If my electric light bill was \$3.50 for October and only \$2.75 for September, what was the per cent of increase?

20. If 80% of a number equals 60, what is the number?

21. If 5% of a number equals 45, what is the number?

22. One year Mildred invested 60% of her savings in Liberty bonds and the rest in War Stamps. If she bought \$600 worth of Liberty bonds, how much were her savings? How much did she invest in War Stamps?

23. The shop teacher cut a strip of wood 15 in. long, which was 30% of the length of the board from which it was cut. How long was the board?

24. Lucy's father received as annual interest $4\frac{1}{2}\%$ of the money he had invested. If he received a yearly interest of \$1800, how much money had he invested?

25. A discount of 6% was allowed Mr. Anderson on a certain bill of goods. If he deducted \$1.80, what was the amount of the bill?

26. A baseball team lost 35% of its games. If it won 78 games, how many games did it play? How many did it lose?

27. A certain school had 650 boys on register; this was 125% of the number of girls in the school. How many girls were there in the school?

28. A certain ocean steamer is 810 ft. long; this is $112\frac{1}{2}\%$ of the height of the Woolworth Building. How high is the Woolworth Building?

29. A man whose salary was \$2400 had it increased to \$3200. What was the per cent of increase?

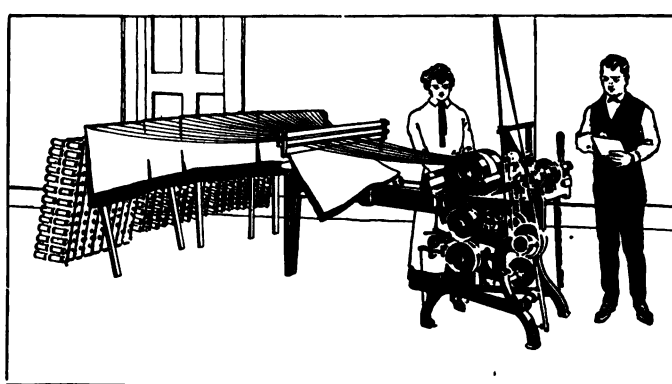
30. What per cent of an acre is a strip of land containing 120 sq. rd.?

31. If 29% of the 5,047,200 inhabitants of the City of New York bought Liberty bonds of the third issue, how many of these inhabitants bought such Liberty bonds?

32. In one school only .9% of the 2000 pupils in attendance failed to join the Red Cross. How many pupils of that school joined the Red Cross?

33. The war tax on theater tickets in 1920 was 10%. How much did Lucy pay for 2 orchestra seats, box-office price \$2.50 each, and 3 balcony seats, \$1.00 each?

PROBLEMS ABOUT THE SILK INDUSTRY



There are two kinds of silk, real and artificial. Real silk is obtained from the silkworm, while artificial silk is obtained from wood pulp.

1. If it requires 2600 cocoons of the silkworm to make a pound of silk, how many cocoons are required for a ton of silk?

2. The greatest producers of raw silk are Japan and China. In 1919 the silk industry of Japan employed 400,000 women, while in China 180% of this number were employed. How many women were employed in the silk industry in China?

3. The United States produces more manufactured silk articles than any other country, but is entirely dependent on foreign nations for its raw-silk supply. During 1919 the United States imported 44,800,000 lb. of raw silk, of which total Japan furnished 33,700,000 lb., China, 9,000,000 lb., and European countries, the remainder. What per cent of the silk imports came from Japan? from China? from Europe? (Drop all fractions of per cent.)

4. The total value of the raw silk imported in 1919 was $329,338,872, of which amount Japan received 80%. How much did Japan alone receive for its raw-silk exportations to the United States?

5. The wages of the Japanese workers who reel the silk from the cocoons range from $.50 to $1 for a day that varies in length from 10 hr. to 14 hr. How long would it take one of these workers to earn $30 (which is about the average weekly wage of an American worker) if he is paid $.80 a day and works 6 da. a week?

6. In China the wages average $.30 a day of from 12 hr. to 14 hr. How long would it take a Chinese silk worker to earn $30, if he works 6 da. per week?

7. In 1920 the price of raw silk rose to $16.80 a pound but later dropped to $10.20 a pound. What was the per cent of decrease?

8. In 1920 the United States produced $500,000,000 worth of silk products, as against $100,000,000 worth of products in 1900, and $250,000,000 worth in 1915. What was the per cent of increase in production in 1920 over that of 1900? over that of 1915?

9. In 1900 our annual exports of silk goods amounted to $250,000. In 1918 we exported $20,000,000 worth of such goods. Find the per cent of increase.

APPLICATIONS OF PERCENTAGE — REVIEW

(See the chapters on Applications of Percentage, pages 110–150.)

1. What is meant by trade discount?

2. What is meant by the terms of a bill?

3. Explain: "Terms: 5/30, 7/10"; "Terms: 2/10, net 30 days."

4. How do you find the trade discount?

5. What is meant by the net price or net cost?

6. On what is the profit or loss always reckoned?

7. What is meant by selling at an advance?

8. When goods are sold at a loss, which is greater, the selling price or the cost?

9. When goods are sold at a gain, which is greater, the selling price or the cost?

10. What is commission?

11. On what is the rate of commission reckoned?

12. Give three different names applied to persons who are paid commission for services rendered.

13. What is meant by the assessed value of property?

14. What is the present tax rate in your town?

15. What is interest?

16. What term in interest examples corresponds to the term "base" in percentage?

17. What is meant by the net proceeds?

18. What is meant by "real estate" or "real property"?
19. What is an income tax?
20. In what different ways may the tax rate be stated?

[Use pencil when needed]

Find the trade discount on the following bills:

	a	*b*	*c*
1.	\$650, less 5%	\$300, less 6%	\$85, less 10%
2.	\$62.50, less 5%	\$90, less 7%	\$500, less 7½%
3.	\$45, less 8%	\$150.25, less 10%	\$75.60, less 2%

Find the net price:

	List Price	Rate of Discount		List Price	Rate of Discount
4.	\$ 200.00	6%	12.	\$1200	5%
5.	\$ 150.70	7%	13.	\$ 27.60	10%
6.	\$ 130.75	6½%	14.	\$ 312.10	8%
7.	\$ 58.50	3%	15.	\$ 120	10%, 10%
8.	\$ 210.00	15%, 10%	16.	\$ 350	30%, 10%
9.	\$ 240.00	25%, 10%	17.	\$1200	15%, 10%
10.	\$ 690.00	33⅓%, 12½%	18.	\$1400	25%, 20%, 10%
11.	\$6000.00	20%, 10%	19.	\$1500	10%, 10%, 10%

Find the rate of discount:

	List Price	Discount	Net Price	Rate of Discount
20.	\$ 600	\$ 30	—	?
21.	\$ 800	—	\$ 752	?
22.	\$1200	—	\$1104	?
23.	\$1500	\$105	—	?
24.	\$ 450	—	\$ 441	?
25.	\$ 900	—	\$ 846	?
26.	—	\$ 32	\$ 368	?
27.	—	\$ 49	\$ 651	?

Find the value of the missing terms:

	Cost	Rate of Gain	Rate of Loss	Gain	Loss	Selling Price
28.	$1600.00	6%	—	—	—	?
29.	$ 600.00	$4\frac{3}{5}$%	—	—	—	?
30.	$1800.00	—	$2\frac{2}{3}$%	—	—	?
31.	$ 150.00	—	$\frac{1}{8}$%	—	?	?
32.	$ 25.00	250%	—	—	—	?
33.	$.60	125%	—	—	—	?
34.	$.75	—	60%	—	—	?
35.	$ 120.00	?	—	$ 6.	—	?
36.	$ 160.00	—	?	—	$ 4.	—
37.	$.50	?	—	$ 1.00	—	—
38.	$ 4.00	?	—	$ 12.00	—	—
39.	$.60	?	—	$ 1.00	—	—
40.	$ 20.00	?	—	—	—	$ 25
41.	$ 32.00	—	?	—	—	$ 24
42.	$ 120.00	—	?	—	—	$ 80
43.	$ 36.00	?	—	—	—	$ 90
44.	$.08	?	—	$.12	—	—
45.	?	10%	—	$ 50.00	—	?
46.	?	—	5%	—	$ 20.00	?
47.	?	20%	—	$ 16.00	—	?
48.	?	75%	—	$300.00	—	?
49.	?	—	$37\frac{1}{2}$%	—	$240.00	?
50.	?	150%	—	$ 60.00	—	?
51.	?	—	$3\frac{1}{2}$%	—	$ 43.40	?
52.	?	20%	—	—	—	$480
53.	?	10%	—	—	—	$220
54.	?	—	30%	—	—	$280

Find the missing terms:

	Amount of Sales	Rate of Commission	Commission	Net Proceeds
55.	$ 1,500	$2\frac{1}{2}\%$	?	?
56.	$20,000	?	$300	—
57.	$ 4,000	?	—	$3500
58.	$ 1,600	$3\frac{1}{4}\%$	?	?
59.	?	5%	$160	—
60.	?	2%	$ 60	—
61.	?	?	$400	$4600
62.	?	?	$800	$3200
63.	?	10%	?	$1890

Find the tax:

	Assessed Value	Tax Rate	Tax
64.	$16,000	$1\frac{3}{4}\%$	?
65.	$24,000	2.15%	?
66.	$50,000	2.21%	?
67.	$25,000	$2.10 per $100	?
68.	$ 8,500	16 mills	?
69.	$15,000	$21.50 per $1000	?

REVIEW PROBLEMS [Use pencil when needed]

(See pages 110–150 for the solution of similar problems.)

☛ *Do not forget to read the problem very carefully before attempting to solve it. Be sure to note what is required and what is given, and to check each step in your solution of the problem.*

1. Certain supplies listed at $84.50 were sold at discounts of 10% and 10%. Find the net cost.

2. Mrs. Fuller was allowed a discount of 6%. How much did she have to pay for the following goods bought last month?

$\frac{1}{2}$ doz. stockings at \$16 per dozen
3 shirt waists at \$4.50 each
9 handkerchiefs at \$8 per dozen

3. A retailer bought 35 yd. of ribbon at 12¢ a yard and sold it at an advance of 40%. Find the selling price of all.

4. Hats bought at auction at \$19.50 per dozen were sold at a profit of 150%. Find the selling price of each hat.

5. A shirt manufacturer found that he had several pieces of shirting, amounting to $82\frac{1}{2}$ yd., which he no longer could use. It had cost him on the average 60¢ a yard. He sold all at a reduction of $8\frac{1}{2}$%. Find the selling price.

6. A retailer bought vests at \$42 per dozen, less 8%, and sold them so as to gain 100%. What was the selling price per vest?

7. A saleslady was allowed $1\frac{1}{2}$% commission on all sales made during evenings. She sold \$450 worth of goods during the evenings of last week. What commission did she earn last week?

8. A traveling salesman received an annual salary of \$2500 a year and a commission of $6\frac{1}{2}$% on all sales. His last year's sales amounted to \$72,000. How much did he earn last year?

9. A salesman was allowed a commission of $7\frac{1}{2}$% on all sales. Last Friday he sold 36 doz. shirts @ \$27.50 and 18 doz. shirts @ \$21. What was his commission?

10. A manufacturer gained \$2.25 on every hat he sold. If it cost him \$1.50 to make each hat, what per cent profit did he make?

11. This manufacturer received a discount of \$4.50 on a bill of goods amounting to \$75. What was the rate of discount?

12. A golfer bought a golf club for \$3.50 and sold it the next day for \$3.75. What per cent did he gain?

13. He sold another club for \$1.50, thereby losing \$.50. What per cent did he lose?

14. A florist made a profit of 40% by selling a plant at a profit of \$1.50. How much did the plant cost him, and for how much did he sell it?

15. A jobber made a profit of \$2.25 on every dozen shirts he sold at a gain of 15%. What was the selling price per dozen shirts?

16. Overcoats priced at \$25 were sold during a sale at \$17.50. Find the per cent of reduction.

17. Mr. Alton paid \$148.80 to settle a bill of \$160. What per cent discount was he allowed?

18. Butter increased in price from 48¢ a pound to 82¢ a pound during the war. What was the per cent of increase?

19. A furrier selling certain scarfs during a sacrifice sale at a reduction of 15%, charged \$34 for each scarf. What was the original sale price?

20. A jobber bought a consignment of dress goods at \$1.20 a yard. He sold 150 yd. at \$1.60 a yard and 200 yd. at \$1.75 a yard. What per cent of profit did he make?

21. Mrs. Mannering, a milliner, bought 2 doz. hats @ \$24, less a discount of 10%. She sold them at \$4 each. What per cent of profit did she make?

22. A dealer bought 150 coats at \$15 each. He sold 60% of them at a gain of 40%, and the balance at a loss of 5%. Find his gain or loss per cent on the entire transaction.

23. A manufacturer sold coats at a profit of 30%. If his selling price was \$910, what was his gain?

24. A certain table was sold for \$12.18, which was 12% greater than the cost. Find the cost.

25. An engine was sold at $8\frac{1}{3}\%$ above cost. If the selling price was \$2600, what was the cost?

26. A clothier sold a bolt of woolen cloth for \$120 during the war, thereby gaining 250%. How much did he gain?

27. Before the war he sold the same goods at \$1.50 a yard, at a gain of 25%. What was his gain?

28. Post cards bought at 60¢ per 100 were sold at the rate of 3 cards for 5¢. Find the gain per cent.

29. Shirt waists were sold during a sale for \$4.95 each, at a profit of \$.45. Find the gain per cent.

30. Oranges bought at \$2.40 a gross were sold at the rate of 3 oranges for 10¢. Find the gain per cent.

31. A jobber bought novelties at \$18 a dozen, less 8%, and sold them at a profit of 125%. What was his selling price?

32. A retailer bought neckwear at \$15 a dozen, less 10%, and sold it so as to make a profit of 100% on his investment. What was the selling price of each necktie?

33. Mrs. Freeman sold her piano at a loss of 35%, thereby losing \$112. Find the selling price of the piano.

34. Dolls were sold at a profit of 200%. If the selling price was \$3.60 each, how much was gained on each doll?

35. Jewelry was sold at an advance of 125%. How much was gained on 10 chains sold at \$24 each?

36. A jobber bought 25 doz. caps for \$175. He sold them for \$.75 each. Find the per cent of profit.

37. Bananas bought at 2 for 3¢ were sold at 4¢ each. Find the rate of profit.

38. For collecting a debt of $18,000 a lawyer charged a fee of $270. What per cent did he charge?

39. A real estate agent earned $150 by selling property for $12,000. What was the rate of his commission?

40. A commission merchant remitted $2600 after deducting his commission of $400. What was the rate of his commission?

41. Find the rate of commission when the net proceeds are $425 and the commission is $50.

42. By selling flour at a commission of $2\frac{1}{2}\%$, a commission merchant made $400 on one sale. What was the selling price of the flour?

43. In a certain town a house was valued at $7500 and the tax rate was $17.50 per $1000. Find the tax.

44. What was the tax on property assessed at $15,600, when the tax rate was $15\frac{4}{5}$ mills?

45. When the tax rate was 2.32%, what was the tax on property assessed at $21,500?

46. Mrs. Austin owned property assessed at $45,000 and paid a tax of $2\frac{2}{5}$ mills on the dollar. Mrs. Franklin owned property assessed at $48,000 and paid a tax of $2.25 per $100. Whose tax bill was greater, and how much greater?

47. Find the net cost of 12,500 bags at $4.50 per M., less 40%, 10%, 5%.

48. When the net proceeds were $919.20 and the rate was 3%, what was the amount of sales?

49. A jobber made a profit of 77¢ on each dozen neckties he sold at a profit of 28%. Find the selling price per dozen neckties.

50. Property worth $26,500 was assessed at $\frac{3}{5}$ of its value. Find the tax due if the rate was $17.10 per $1000.

51. The following were the tax rates per $100 for the City of New York in 1919:

Manhattan	$2.32
Bronx	$2.37
Brooklyn	$2.36
Queens	$2.37
Richmond	$2.41

How much did the owner pay in taxes on property assessed at $10,000 in Manhattan? in Brooklyn? in Queens? in the Bronx? in Richmond?

52. Real property in Manhattan was assessed in 1919 at $5,115,811,621. What tax did this yield?

53. Real estate in the Bronx was assessed in 1919 at $731,808,972. Find the tax this yielded.

54. Brooklyn real estate was assessed in 1919 at $1,865,123,-952. Find the tax this yielded.

55. Richmond real property was assessed in 1919 at $110,750,732. Find the tax on this property.

DUTIES AND CUSTOMS



We have already learned in studying taxes that governments have many expenses which are met almost entirely by taxes on property and on incomes. One of the ways in which our Federal government obtains money to pay its expenses is by levying a tax or *tariff* on certain goods imported from other countries. This tax is known as an **import** or **custom duty**.

Duties are of two kinds, *specific* and *ad valorem*.

A **specific duty** is one levied at a specified sum per yard, gallon, pound, etc.

An **ad valorem duty** is one levied at a certain per cent of the cost of the goods.

Duties are collected at customhouses, located at all ports of entry.

The schedule of duties known as the **tariff** is fixed by Congress.

The government makes certain allowances for leaks, weight of barrels or bags, etc.

The allowance made for the weight of bags, barrels, or cases in which goods are shipped is called **tare**.

The allowance made for loss of liquids from barrels, casks, etc. in shipping is called **leakage**.

The allowance made for the loss of liquids from bottles broken in shipping is called **breakage**.

The weight after allowance has been made for tare, leakage, or breakage is called the **net weight**.

Duties are reckoned on net weights.

The schedule of duties contains a list of duties levied on all kinds of imported goods. Some goods are admitted free of duty (as, bananas, coffee, salt, etc.); some goods are subject to a specific duty only; some to an ad valorem duty only; others to both a specific and an ad valorem duty.

[Without pencil]

1. What is the duty on 100 lb. of raisins at 2¢ per pound?

2. If the tariff law requires a duty of $\frac{1}{2}$¢ per pound on lemons, what is the duty on 200 lb. of lemons?

3. What is the duty on 500 lb. of plums, if the duty is 10¢ per bushel, each bushel weighing 50 lb.?

4. If the duty on oxalic acid is $1\frac{1}{2}$¢ per pound, what duty must be paid on 50 lb. of oxalic acid?

5. What duty must be paid on 10 bags of brown Japan rice, each containing 100 lb., if the duty is $\frac{5}{8}$¢ a pound?

6. The duty on velvet ribbon is 40%. What duty must be paid on an importation of $500 worth of velvet ribbon?

7. If the duty on sardines is 25%, how much duty must an importer pay on $400 worth of sardines?

8. A merchant imports $100,000 worth of cut diamonds. If the duty is 20%, what duty does he pay?

9. The duty on razors is 55%. What duty must be paid on an importation of $1000 worth of razors?

10. The tariff on cigar holders is 60%. How much is the tax on $250 worth of cigar holders?

☞ *Check all work to test the correctness of your answers.*

The following is a list of some articles frequently imported by merchants in this country, with the tariff (tax or duty) imposed by the tariff law in operation in 1920:

Aniline dyes	30%
Barley	15¢ per bushel (48 lb. to the bushel)
Beans (vanilla)	30¢ per pound
Brushes	35%
Buttons, ivory	40%
Camphor, crude	1¢ per pound
Camphor, refined	5¢ per pound
Chinaware	55%
Chocolate confectionery	2¢ per pound
Cigars	$4.50 per pound, and 25%
Cloth, cotton	30%
Cloth, wool	35%
Cocoa butter	3½¢ per pound
Cutlery	30%
Embroidered articles	60%
Feathers (artificial)	60%
Flowers (artificial)	60%
Fur skins, dressed	30%
Glassware	45%
Handkerchiefs, linen	35%
Knit underwear	30%
Knives and forks, with handles	30%
Laces	60%
Lemons	½¢ per pound
Lenses	25%
Linen manufactures	35%
Macaroni	1¢ per pound
Olive oil	30¢ per gallon
Perfumery	60%
Raisins	2¢ per pound
Rice, cleaned	1¢ per pound
Rugs (Oriental)	50%
Silk cloth	45%
Silk clothing	50%
Silk parasols	35%
Silk scarfs	60%
Soap (unperfumed)	10%
Spices:	
Bombay or wild mace, ground	18¢ per pound, and 20%
Paprika, ground	1¢ per pound, and 20%
Pepper, ground	1¢ per pound, and 20%
Tobacco, leaf (stemmed)	$2.50 per pound
Toys	35%
Velvet, cotton	40%
silk	50%
Violins	35%
Woolen fabrics	35%

[With pencil]

Using the rates of duty given on page 233, find the duty on importations of:

1. $5000 worth of toys.
2. $12,500 worth of woolen fabrics.
3. 600 quarts of olive oil.
4. 280 lb. of chocolate confectionery.
5. 2 tons of vanilla beans.
6. $5600 worth of silk cloth.
7. 500 lb. of ground paprika costing 50¢ a pound.
8. $450 worth of perfumery.
9. $650 worth of knit underwear.
10. $4500 worth of laces.
11. $8000 worth of toys.

NOTE. Unless otherwise directed, use the approximate normal value of foreign money.

12. Mr. Spalding imported knives and forks from England at 15*s.* a dozen. What was the cost in United States money for 25 doz., including duty?

13. Mr. Maurice imported silk from Lyons, France, listed at 6 fr. a meter. How much did he pay in United States money for 150 m. of such silk, including duty?

14. Mr. Romano is an importer of Italian foodstuffs. Last week he imported 50 gal. of olive oil, listed at 8 lire a gallon, and 500 lb. of macaroni, listed at 25 lire per 100 lb. What was his total cost in United States money, including duties?

15. An importer bought artificial flowers in France for 5000 francs. What was his cost in United States money, including duty?

16. A department store imported 200 doz. linen handkerchiefs costing 18*s.* a dozen. What was the total cost in United States money?

17. A clothing manufacturer imported from England 4800 yd. of woolen cloth, costing 5*s.* a yard. What was the total cost in United States money?

18. A fruit dealer imported the following:

10 boxes of raisins, 36 lb. each, at 20¢ per pound
20 boxes of lemons, 40 lb. each, at 3¢ per pound

Find the total cost.

19. An importer bought linen handkerchiefs invoiced at 1000 fr. After paying the duty he sold all at a profit of 50%. How much did he get for the handkerchiefs in United States money?

20. A. L. Wild and Company, importers and jobbers, sold a quantity of lace they imported from Switzerland, invoiced at 5000 fr., at a profit of 25%. What was the selling price in United States money?

21. Howard Brothers imported perfumery invoiced at 1000 fr. They sold it for $400. What per cent profit did they make? (Do not forget to include the duty.)

22. Cotton velvet invoiced at 2000 fr. was imported by A. R. Hughes and sold for $840. What was the per cent of profit?

23. George Atwood imported brushes invoiced at £50 and later sold them at a profit of 50%. What was the selling price?

24. A tobacco concern imported 15,000 cigars invoiced at $75 per M., weighing on an average 12 oz. per box of 50 cigars. Find the total cost.

25. Study the tariff schedule on page 233 and prepare a set of five problems on importations of silks, laces, and linens.

INTEREST — REVIEW

(See the chapter on Interest, pages 151–166.)

[Without pencil]

1. What is interest?
2. What are the terms used in all interest examples?
3. What is the legal rate of interest in your state?



4. What is meant by *usury?*
5. In computing simple interest, how many days do we count to the month? how many days to the year?
6. What two common methods are used for finding simple interest?
7. What is the annual interest on a dollar at 5%? at 6%? at 3%?
8. What is the semiannual interest on a dollar at 6%? at 4%?
9. How do you find the number of years, months, and days in the following interest example? "Find the interest on $500 from Jan. 8, 1919 to June 15, 1921."

Find the interest for 1 yr. on:

	a	*b*	*c*
10.	$ 500 at 4%.	$ 600 at 3%.	$ 400 at 5%.
11.	$1000 at $5\frac{1}{2}$%.	$2000 at $2\frac{1}{2}$%.	$1000 at $4\frac{1}{4}$%.

Find the annual interest on:

	a	*b*
12.	A \$1000 Lib. bond at $4\frac{1}{4}\%$.	A \$500 Lib. bond at 4 %.
13.	A \$ 100 Lib. bond at $4\frac{1}{4}\%$.	A \$ 50 Lib. bond at $3\frac{1}{2}\%$.
14.	A \$1000 Lib. bond at $3\frac{1}{2}\%$.	A \$500 Lib. bond at $4\frac{1}{4}\%$.
15.	\$150 worth of Lib. bonds at 4%.	\$200 worth of Victory bonds at $4\frac{3}{4}\%$.

Find the interest at 6% on:

	a	*b*
16.	\$ 500 for 2 yr.	\$2000 for 8 mo.
17.	\$ 600 for 1 yr. 5 mo.	\$1000 for 1 yr. 4 mo.
18.	\$ 400 for 3 mo.	\$ 100 for 2 yr. 2 mo.
19.	\$ 600 for 1 yr. 2 mo.	\$ 120 for 1 mo.
20.	\$1200 for 4 mo.	\$1600 for 1 yr. 6 mo.

☞ *Check all work to test the correctness of your answers.*

Find the interest on: [With pencil]

	a	*b*
1.	\$ 500 for 4 mo. at 3%.	\$2500 for 1 yr. 3 mo. at 4%.
2.	\$ 700 for 3 mo. at 5%.	\$1600 for 2 yr. 6 mo. at 5%.
3.	\$ 800 for 4 mo. at 4%.	\$ 750 for 1 yr. 8 mo. at 6%.
4.	\$1200 for 9 mo. at 6%.	\$1000 for 1 yr. 4 mo. at $3\frac{1}{2}\%$.
5.	\$1000 for 2 yr. 9 mo. at 4%.	\$1200 for 1 yr. 6 mo. at $4\frac{1}{2}\%$.

Find the interest:

	Principal	Rate	Time
6.	\$3600	5%	2 yr. 1 mo.
7.	\$ 180	4%	1 yr. 4 mo.
8.	\$2400	3%	1 yr. 8 mo.
9.	\$1850	6%	3 yr. 2 mo.
10.	\$ 650	$3\frac{1}{2}\%$	1 yr. 3 mo.

Find the interest:

	Principal	Rate	Time
11.	$ 375	$4\frac{1}{2}\%$	10 mo.
12.	$ 1650	$5\frac{1}{2}\%$	2 yr. 9 mo.
13.	$ 2100	6%	1 yr. 1 mo.
14.	$ 1750	$4\frac{1}{4}\%$	2 yr. 6 mo.
15.	$ 640	$3\frac{1}{4}\%$	1 yr. 5 mo.

Find the interest and the amount:

	Principal	Rate	Time
16.	$ 120	5%	95 da.
17.	$ 4200	6%	75 da.
18.	$ 3600	4%	150 da.
19.	$ 1850	3%	210 da.
20.	$ 1250	6%	2 mo. 12 da.
21.	$ 640	5%	8 mo. 10 da.
22.	$ 360	4%	6 mo. 15 da.
23.	$ 720	6%	4 mo. 12 da.
24.	$ 480	$3\frac{1}{2}\%$	5 mo. 20 da.
25.	$ 900	$4\frac{1}{2}\%$	3 mo. 25 da.
26.	$ 600	4%	1 yr. 4 mo. 10 da.
27.	$ 150.50	6%	1 yr. 3 mo. 15 da.
28.	$ 240.40	3%	2 yr. 1 mo. 10 da.
29.	$ 180.	5%	1 yr. 9 mo. 12 da.
30.	$ 2100.	$3\frac{1}{2}\%$	7 mo. 5 da.
31.	$ 172.60	4%	1 yr. 3 mo. 20 da.
32.	$ 250.10	5%	2 yr. 4 mo. 10 da.
33.	$ 450	6%	8 mo. 21 da.
34.	$ 5000	4%	2 da.
35.	$10,000	$5\frac{1}{2}\%$	3 da.
36.	$20,000	6%	4 da.
37.	$15,000	$4\frac{1}{2}\%$	5 da.
38.	$12,000	5%	6 da.

Find the interest and the amount:

	Principal	Rate	Time
39.	$ 500	4%	From June 8, 1919 to Aug. 10, 1921
40.	$ 160	5%	From Apr. 5, 1918 to July 8, 1920
41.	$ 360	3%	From May 16, 1919 to Oct. 7, 1921
42.	$1080	6%	From Mar. 5, 1920 to Sept. 2, 1922
43.	$ 720	5%	From Oct. 9, 1920 to Jan. 15, 1921
44.	$ 200	$3\frac{1}{2}$%	From Nov. 12, 1920 to May 8, 1922
45.	$ 175	3%	From Dec. 5, 1920 to June 2, 1921
46.	$ 350	6%	From Feb. 13, 1920 to Jan. 6, 1921
47.	$ 800	$4\frac{1}{2}$%	From July 18, 1920 to May 10, 1922
48.	$1650	4%	From Sept. 5, 1919 to July 1, 1921

PROBLEMS [Use pencil when needed]

1. Mary bought a $100 Liberty bond of the fourth issue, yielding $4\frac{1}{4}$% interest. What was her annual interest?

2. Her brother bought two $50 bonds and one $100 bond of the third issue, yielding $4\frac{1}{4}$% interest. What income did he receive each half year?

3. If the Liberty bonds of the second issue yielded 4% interest, what was the semiannual income on Harry's three $50 Liberty bonds?

4. The graduating classes presented the school with three $50 bonds, one of the second issue, one of the third issue, and one of the fourth issue. What annual income did the school derive from these bonds?

5. A manufacturer borrowed $1500 from his bank for 90 da. at 6% interest. How much did he pay to settle his debt?

6. Mr. Linton borrowed $800 from Mr. Carlin on Mar. 10 at 6% interest. He returned the money with interest on Sept. 6 of the same year. How much did he return?

7. A dressmaker failed to pay her bill of $75 on Apr. 8 when it was due. She paid it on Aug. 4. If she was charged 5% interest, how much did she pay?

8. Helen's father owned two $1000 bonds that paid 8% interest per annum. What annual interest did they yield?

9. A speculator borrowed $5000 at 6% interest, and immediately invested it in property which he sold 4 mo. later for $7500. After paying his debt on the date of sale, what was his net profit?

10. A jobber borrowed $1500 at 6% interest on Aug. 15. He invested it in merchandise which he sold at a profit of 20%, and settled his debt on Oct. 15. What was his net profit?

11. A debt of $1200, due on May 9, 1920, was paid on Apr. 15, 1921 with interest at 5%. How much was paid?

12. A certain bank paid $4\frac{1}{4}\%$ interest on money deposited in it and lent this money to depositors at 6% interest. How much did it make in 6 mo. on deposits amounting to $500,000?

13. Mr. Thompson bought some property for $12,500, paying $8000 in cash and promising to pay the rest in 3 yr. with interest at $5\frac{1}{2}\%$. How much must he pay at the end of 3 yr.?

14. A man borrowed $1800 from a banker at 6% per annum, with the understanding that he might return it with interest whenever he desired. If he settled his debt 8 mo. 12 da. later, how much did he pay?

15. On Apr. 4 a clothier bought a bill of goods amounting to $1200, terms 2%, 10 days. He paid immediately, borrowing the money for 30 days at 6% interest. On May 1 he sold the goods for $1500. After paying what he owed on May 4, what was his profit?

PROMISSORY NOTES

Harold's father needed $1000 more than he had to purchase a house in the suburbs. He borrowed it from his Building and Loan Association, and gave the following note, promising to pay $1000 with interest at 6%, at the end of one year:

TIME NOTE

$\$1000\frac{no}{100}$ *New York, N. Y., Oct. 15, 1921*

One year after date, I promise to pay to the order of

The Halcyon Building and Loan Association

One thousand $\frac{no}{100}$ *Dollars,*

with interest at 6 per cent. Value received.

Charles Morton

Very often a business man finds it necessary to borrow money to transact his business. It is customary for the person who borrows money to give a written promise to repay the borrowed sum of money. Such a written promise is called a promissory note.

A written promise to pay a certain sum of money at a specified time to a certain person is called a **promissory note.**

In the above note, Charles Morton, the person who signed the note, is called the **maker.** He promises to pay $1000 and interest for one year at 6%. The Halcyon Building and Loan Association, the company to whom the maker promises to pay

the money specified, is called the **payee**. The sum named in the note, $1000, is called the **face** of the note. The date on which the note is due, one year after Oct. 15, 1921, is called the **day of maturity**. The note is a **time note** because it is payable after date.

The words "to the order of" or "or order" or "bearer" make a note **negotiable**. A negotiable note can be sold or transferred to another person.

The person who owns the note is called the **holder**.

All treasury notes and bank bills are negotiable notes payable to bearer and are transferable by delivery. (Examine some bank bills.)

Notes payable to a person or order are transferable by **indorsement**.

The name written on the back of a note is the name of the *indorser*. The indorser is responsible for the payment of the note, if the maker fails to pay it.

Sometimes the maker agrees to pay whenever the payee wishes the money or "demands" it. Such a note is called a **demand note**.

DEMAND NOTE

$400 $\frac{no}{100}$ *Boston, Mass., Oct. 20, 1921*

On demand I promise to pay to the order of

Thomas F. Walker

Four hundred $\frac{no}{100}$ *Dollars.*

at the Halcyon Bank. Value received, with interest.

Daniel F. Jackson

Facts to be remembered about notes.

1. Every note must have the following on it: date, face, name of payee, name of maker.
2. If the time of payment is not mentioned, the note is payable on demand.
3. The words "for value received" may be omitted, although it is customary to include them.
4. A note may be written on any paper with either pencil or ink, or a printed form may be filled in.
5. A note made out on Sunday is void.
6. If a note does not state that interest is to be paid, it does not bear interest until after it is due.
7. The holder has a claim against each person who indorses the note.
8. When no rate of interest is specified, the legal rate in the place where the note is made may be charged.
9. Sometimes the maker of a note is required to deposit with the payee or holder some property of sufficient value to cover the amount of the note, such as bonds, stocks, mortgages, etc. Such property is known as **collateral security**.
10. The day of maturity is the day on which the note falls due. When the time of the note is given in days, the note *matures after the exact number of days has elapsed.*

 When the time of a note is given in months, the *note matures on the same day of the month of maturity as the date given on the note.*

 EXCEPTION. — A note for 3 mo. dated Jan. 31 matures April 30, and a note for 3 mo. dated Nov. 30 matures Feb. 28 (or Feb. 29 in a leap year). In all such cases the last day of the month is the date of maturity.

[Without pencil]

1. What is a promissory note?
2. Name four essentials of a note.
3. What is the face of a note?
4. When is a note negotiable?
5. What is meant by an interest-bearing note?
6. Who is the payee? the holder?

7. How long does a note have to run? When is a note due? How is the day of maturity found?

8. What two kinds of notes are there?

9. What is meant by "collateral security"?

10. In what respect does a note differ from a check?

11. How is a note made negotiable? non-negotiable?

12. What is the effect of an indorsement on a note?

[With pencil]

1. Give the maker, the face, and the payee of the following notes:

$8000\frac{no}{100}$ *Chicago, Ill., May 16, 1921*

On demand I promise to pay to the order of

James Watson

Eight thousand $\frac{no}{100}$ *Dollars*

with interest at 6 per cent. Value received.

Horace Downs

$500\frac{no}{100}$ *St. Louis, Mo., June 7, 1921*

Three months after date I promise to pay to the order of James Dillon

Five hundred $\frac{no}{100}$ *Dollars*

at the First National Bank. Value received.

Frank E. Evans

2. Write a note with yourself as maker and Leonard Towns as payee; date, June 4, 1921; time, 4 mo.; face, $450.

3. Write a demand note in which the payee is Samuel Cole, the maker is Martin Waters, the date is Apr. 6, 1921, the face is $4000, and the interest is 4%.

4. Write a note for $650 payable by Louis Thompson to you 60 days after date, with interest at 5%.

5. Write a note with yourself as maker, a classmate as payee, dated to-day, due in 60 days, the face being $500.

6. On Sept. 15, 1921, James Lander bought goods to the amount of $6200 from Calder and Snowden, giving in payment a note due in 3 mo. Write the note.

7. On Dec. 2, 1921, Arthur Stanton bought bristles valued at $1500 of the Surety Bristle Company. He gave his note in payment, due in 4 mo., with interest at 5%. Write the note.

Write notes from the following data, supplying the year:

	Date	Face	Time	Maker	Payee	Rate of Interest
8.	Aug. 8	$ 500.00	2 mo.	L. I. Best	F. E. Hurd	4%
9.	Jan. 5	$1200.00	60 da.	A. T. Bing	C. A. Colt	6%
10.	Sept. 19	$ 569.50	90 da.	F. C. Coe	S. I. Earl	5%
11.	Mar. 10	$ 360.00	6 mo.	L. A. Hart	L. T. Fall	$4\frac{1}{2}$%
12.	Nov. 18	$1875.00	4 mo.	I. F. Dent	D. O. Bates	$5\frac{1}{2}$%

To find the day of maturity.

Example 1: A note dated Feb. 9, 1921, was due in 60 days. Find the day of maturity.

Work

The day of maturity was the 60th day after Feb. 9.

Feb. Mar. April

19 days left + 31 days + 10 days = 60 days

April 10 = the day of maturity, *Ans.*

Example 2: A note dated Sept. 12 was due in 3 mo. Find the day of maturity.

WORK

The third month after September is December. Therefore Dec. 12 was the day of maturity. (Since September is the ninth month, 3 mo. after that was the twelfth month, or December.)

☞ *Be sure to know the numerical order of the months.*

[Use pencil when needed]

Find the day of maturity of the following:

	a	*b*
1.	1-month note drawn Apr. 10	3-month note drawn Oct. 16
2.	30-day note drawn July 15	4-month note drawn Feb. 19
3.	60-day note drawn Mar. 4	60-day note drawn Feb. 17
4.	2-month note drawn May 18	6-month note drawn Mar. 12

Copy, and enter the day of maturity of each note in each column:

DATE	DUE IN 2 MO.	DUE IN 60 DA.	DUE IN 90 DA.	DUE IN 3 MO.
5. Oct. 24				
6. Feb. 15				
7. Sept. 20				
8. Aug. 9				

9. How much was due on the day of maturity on a note of $600, payable in 120 days with interest at 5%?

10. I had a demand note dated June 4, 1921 for $350, payable with interest at 4%. How much was due on it on Aug. 5, 1921?

11. A note of $1200 due in 1 yr. 6 mo. with interest at 6% was paid when due. How much was paid?

BANK DISCOUNT

The holder of a *valid check* may obtain its face value on the very day it is made, while the holder of a *note* cannot obtain its *face* value until the day of maturity.

If the holder of a *check* desires to have it cashed, he indorses it and presents it to a bank or to a person who is satisfied that the check is valid. The amount in full is then paid to him.

If the holder of a *note* does not wish to wait for payment until the day of maturity, he presents the note to a bank, properly indorsed and secured, and the bank discounts it; that is, the bank pays him the amount due on the note, *less* the interest on this sum for the time remaining before the day of maturity.

This interest, collected in advance by the bank, is called **bank discount.**

The amount of the note due at maturity, less the bank discount, is called the **proceeds.**

When the note falls due, the maker must pay the bank the amount due. If the note is an interest-bearing note, the amount due is the face of the note plus the interest for the time specified in the note. If it is a non-interest-bearing note, the amount due is the face of the note.

The day on which a note is discounted is called the **day of discount.**

Banks always charge discount or interest for the *exact number of days* from the day of discount to the day of maturity. This time is called the **term of discount.** In computing bank discount, banks reckon 360 days to the year.

(In some states the law allows *three days of grace* beyond the day of maturity for the payment of notes. The law does *not* allow days of grace in New York and they are not to be considered in this book.)

Find the day of maturity and the term of discount:

Date	*a* Due in 60 Da. Discounted May 2	*b* Due in 90 Da. Discounted June 1	*c* Due in 3 Mo. Discounted June 12	*d* Due in 2 Mo. Discounted May 20
1. Apr. 9				
2. Apr. 15				
3. Apr. 30				

Example 1: Mr. Beaver had a note of $1000 dated Mar. 9, due in 60 da., which he discounted at his bank on April 2 at 6%. How much did he receive for it?

Work

Value,	$1000
Date,	Mar. 9
Day of maturity,	May 8
Term of discount,	36 days
Rate of discount,	6%
Bank discount,	$6
Proceeds,	$994

The day of maturity was the 60th day after March 9, or May 8. (March, 22 da.+April, 30 da.+May, 8 da.=60 da.)

The term of discount was the number of days from Apr. 2 to May 8, or 36 da. (April, 28 da.+May, 8 da.=36 da.)

$$\frac{\cancel{36}^{1}}{\cancel{360}_{\cancel{10}_{1}}} \times \frac{6}{\cancel{100}_{1}} \times \$\cancel{1000}^{\cancel{100}_{1}} = \$6, \text{ bank discount; } \$1000 - \$6 = \$994, \text{ proceeds, } \textit{Ans.}$$

Example 2: How much would Mr. Beaver have received for the note if he had had it discounted on the day it was made out?

Work

Term of discount=60 da.

$$\frac{\cancel{60}^{1}}{\cancel{360}_{\cancel{6}_{1}}} \times \frac{\cancel{6}^{1}}{\cancel{100}_{1}} \times \$\cancel{1000}^{10} = \$10, \text{ bank discount; } \$1000 - \$10 = \$990, \text{ proceeds, } \textit{Ans.}$$

Find the bank discount and the proceeds: [With pencil]

	Face	Term of Discount	Rate
1.	$ 500	30 days	6%
2.	$ 400	36 days	6%
3.	$ 800	60 days	6%
4.	$1200	54 days	6%
5.	$ 900	48 days	6%
6.	$ 300	90 days	6%
7.	$1500	45 days	6%
8.	$ 600	66 days	5%
9.	$1000	72 days	4%
10.	$ 350	24 days	4%

Find the day of maturity of the following notes:

	a		*b*	
	Due in	Drawn	Due in	Drawn
11.	60 da.	Jan. 8	60 da.	Feb. 15
12.	90 da.	Mar. 12	3 mo.	Aug. 17
13.	4 mo.	Apr. 7	120 da.	May 15
14.	2 mo.	Feb. 6	90 da.	Nov. 11
15.	30 da.	Oct. 9	6 mo.	Dec. 18

Find the term of discount of the following notes:

	a		*b*	
	Discounted	Due	Discounted	Due
16.	Mar. 6	May 1	Sept. 9	Nov. 4
17.	Mar. 16	Apr. 30	Oct. 6	Dec. 12
18.	Feb. 27	May 8	Nov. 4	Dec. 14
19.	Nov. 7	Dec. 29	July 17	Sept. 5
20.	June 25	Aug. 14	Mar. 13	June 8

Find the day of maturity and the term of discount of the following notes:

	a			*b*		
	Date	Due in	Discounted	Date	Due in	Discounted
21.	Apr. 6	60 da.	May 16	Sept. 14	6 mo.	Dec. 4
22.	Oct. 15	90 da.	Nov. 20	June 15	3 mo.	July 19
23.	Mar. 16	30 da.	Apr. 2	Jan. 5	3 mo.	Feb. 11
24.	Feb. 5	4 mo.	Apr. 17	Aug. 2	90 da.	Sept. 16

Find the bank discount and the proceeds:

25. Of a note for \$600, dated Mar. 9, due in 2 mo., and discounted at 6% on the day the note was made.

26. Of a note for \$800, dated Sept. 15, due in 90 da., and discounted at 6% at once.

Find the bank discount and the proceeds of the following notes:

	Face	Date	Time	Discounted	Rate
27.	\$ 800	June 14	3 mo.	July 12	6%
28.	\$ 400	Apr. 8	2 mo	May 25	6%
29.	\$ 500	Feb. 18	4 mo	Apr. 6	6%
30.	\$ 600	Oct. 15	3 mo.	Nov. 12	6%
31.	\$ 850	May 6	90 da.	July 1	6%
32.	\$ 760	Nov. 4	60 da.	Dec. 26	6%
33.	\$ 350	Aug. 15	6 mo.	Dec. 10	6%
34.	\$ 620	Nov. 11	30 da.	Nov. 18	5%
35.	\$ 540	July 6	90 da.	Aug. 27	5%
36.	\$1500	Aug. 22	60 da.	Sept. 30	6%
37.	\$ 940	Mar. 27	60 da.	May 2	6%
38.	\$1250	Jan. 13	90 da.	Feb. 26	6%
39.	\$ 780	Aug. 19	60 da.	Sept. 6	7%
40.	\$ 150	Oct. 25	2 mo.	Nov. 16	7%
41.	\$ 580	Sept. 14	3 mo.	Oct. 3	7%

PROBLEMS [With pencil]

1. How much did the owner of a $500 note receive for it if he had it discounted 45 da. before it was due at 6%?

2. What were the proceeds of a note for $80, discounted 36 da. before maturity at 6%?

3. Find the proceeds of a 60-day note for $580, dated Oct. 15, and discounted on Oct. 15 at 6%.

4. Mr. Lester F. Hart had a note for $160, dated May 5, due in 90 da. He had it discounted on the day it was drawn at 6%. Find the proceeds.

5. Mr. Louis Field sold a bill of goods for $250 to Mr. Charles Sanders, who gave his note for the amount, due in 3 mo., dated Mar. 16. Mr. Field had the note discounted immediately at 5%. How much did he get for it?

6. Mr. Allison had the following note discounted on Mar. 18 at 6%. How much did he receive?

$650 $\frac{00}{100}$ New York, Feb. 3, 1921

Sixty days after date I promise to pay

F. L. Allison or order

Six hundred fifty $\frac{00}{100}$ ~~~~~~~~~~~~~~~~~~~~ Dollars

Value received Alexander Menton

7. How much would the holder of a 3-month note for $250, dated Apr. 10, receive for it if he had it discounted May 20 at 6%?

8. A note for $560.50, due in 90 da., is discounted 36 da. after date at 6%. What are the proceeds?

9. How much can I get for a 60-day note for $460, discounted 10 da. after it is drawn at 5%?

10. L. B. Barton had a note for $750 dated May 9 and due in 3 mo. He had it discounted 1 mo. after date at 6%. How much did he receive?

Interest-bearing Notes

Example: Find the bank discount and the proceeds of a note for $1000 dated Apr. 7, due in 3 mo. with interest at 4%, and discounted May 8 at 6%.

WORK

Value, $1010 (Face + Interest)
Date, Apr. 7
Day of maturity (3 mo. after Apr. 7), July 7
Day of discount, May 8
Term of discount (May 8–July 7), 60 da.
Bank discount, $10.10
Proceeds, $999.90

$\frac{1}{\cancel{6}} \times \frac{\cancel{6}^{1}}{\cancel{100}} \times \$\cancel{1010} = \$10.10$, bank discount

$\$1010 - \$10.10 = \$999.90$, proceeds, *Ans.*

Find the bank discount and the proceeds: [With pencil]

	FACE	DATE	TIME	INTEREST	DISCOUNTED	RATE OF DISCOUNT
1.	$1200	Mar. 10	2 mo.	6%	Mar. 10	6%
2.	$1500	July 15	3 mo.	4%	July 15	6%
3.	$2000	Sept. 9	4 mo.	6%	Sept. 9	6%
4.	$5000	Feb. 3	90 da.	4%	Feb. 3	6%
5.	$4000	June 20	60 da.	3%	June 20	6%
6.	$2500	May 24	30 da.	6%	May 24	6%
7.	$1600	Oct. 17	3 mo.	4%	Dec. 19	6%
8.	$2400	Apr. 4	4 mo.	3%	May 6	6%
9.	$1800	Jan. 6	6 mo.	4%	June 6	6%
10.	$ 900	Nov. 5	1 mo.	4%	Nov. 11	6%

PROBLEMS [With pencil]

☞ *Unless you read the problem very carefully and note what is required and what is given you are likely to make mistakes. Before dropping your pencil check your work.*

1. Make out a note for $500 dated to-day, payable in 60 da. at some bank in your neighborhood. The payee is Ralph Dodge; the maker, John Hancock.

2. If Mr. Dodge had the note discounted to-day at 6%, how much did he receive for it?

3. If this note were a note bearing interest at 6%, how much would Mr. Dodge have received for it on the day of maturity?

4. Find the amount due on July 18, 1921, on a demand note of $400, dated Nov. 15, 1920, with interest at 5%.

5. On May 15 Mr. Alexander borrowed $5000, for which he gave his note with interest at 4%, due in 6 mo. How much was due at maturity?

6. If the holder of this note had discounted it at 6% on Sept. 16, how much would he have received for it?

7. On June 14 Louis Stevenson made out a demand note for $1000 payable to Richard Gardner, with interest at 5%. How much did Mr. Gardner receive if payment was made on Feb. 21 of the following year?

8. A 6-month note for $1500, dated May 16, was given in payment of a bill of goods. It bore interest at $5\frac{1}{2}\%$. What was the amount due on it?

9. What were the net proceeds of a note of $620 discounted 24 da. before it was due, at 6%?

10. Find the proceeds of a note for $1500, dated April 5, due in 60 da. and discounted 20 da. before maturity at 6%.

Problems of an Importer



1. On June 9 Guido Romano imported the following:
 20 boxes macaroni, 10 lb. each, at $\frac{1}{2}$ lira per pound
 50 boxes spaghetti, 10 lb. each, at $\frac{1}{2}$ lira per pound
 50 gal. olive oil at $9\frac{1}{2}$ lire per gallon
If the duty on macaroni and spaghetti is 1¢ per pound and on olive oil 30¢ per gallon, what was his total cost in United States money? (Use the approximate normal value.)

2. On June 20 he borrowed $6000 from his bank on his note for 3 mo., which was discounted at once at 6%. What discount did he pay the bank?

3. He sold the macaroni at 20¢ a pound and the olive oil at 80¢ a quart, less 2% discount. How much did he receive for the macaroni and the olive oil?

4. He imported 500 kilos of cheese at $4\frac{1}{2}$ lire a kilo. What was his total cost in United States money, if the duty on cheese was 20%? (Use the approximate normal value.)

5. He sold the cheese at 60¢ a pound. What per cent of profit did he make?

BUSINESS FORMS — REVIEW

Buying and Selling Goods

(See the chapter on Business Forms, pages 167–176.)

[Without pencil]

1. What is a bill?
2. What are the terms of a bill?
3. What is meant by debtor? by creditor?
4. Mention two forms used for writing names of the debtor and the creditor on a bill.
5. What is an invoice?
6. In what two common ways are receipts made out?
7. What should one do when receipting a bill for another person?
8. Why is it wise to keep receipted bills or receipts?
9. Why should bills and receipts be dated?
10. What is a statement?

[With pencil]

1. Make out bills for:

a. A plumber *c.* A shirt manufacturer *e.* A dressmaker
b. An electrician *d.* A butcher *f.* A carpenter

2. Write bills for Andrew F. Tomlinson for the following, and find the net amount due, if the given terms are accepted:

a. To Samuel Curtis — Terms: 6/30
15 pieces cloth, 22½ yd. each, at $3 a yard
12 pieces cloth, 25½ yd. each, at $2 a yard

b. To David Sanders — Terms: 7/10
160 yd. cloth at $2.62\frac{1}{2}$ a yard
240 yd. cloth at $1.87\frac{1}{2}$ a yard

c. To Walter Winters — Terms: 7/10
8 pieces velvet, $22\frac{5}{8}$ yd. each, at $2\frac{1}{4}$ a yard
4 pieces velvet, $23\frac{1}{4}$ yd. each, at $1\frac{1}{2}$ a yard

d. To Albert Lawson — Terms: 7/10
3 pieces velvet, $23\frac{5}{8}$ yd. each, at $1.60 a yard
2 pieces velvet, $22\frac{7}{8}$ yd. each, at $1.25 a yard

3. Write statements for A. F. Lyons and Company for the following unpaid bills:

a. To Daniel N. Stone, Albany, N. Y.

May 5 — Mdse.	$42.16
May 12 — Mdse.	$38.15
May 27 — Mdse.	$92.50

b. To Frank L. Foster, Rochester, N. Y.

May 3 — Mdse.	$172.60
May 10 — Mdse.	$586.12
May 20 — Mdse.	$ 98.50

c. To Paul C. Carter, Chicago, Ill.

May 4 — Mdse.	$ 87.50
May 15 — Mdse.	$122.75
May 18 — Mdse.	$105.62

d. To Louis T. Ryan, Boston, Mass.

May 5 — Mdse.	$175.00
May 17 — Mdse.	$212.50
May 24 — Mdse.	$ 97.60

Paying for Goods

You have learned that business men pay their bills either with *cash* or with *checks*.

Cash may be sent by person or by mail.

Checks may be sent by person or by mail.

As it is inconvenient and unsafe to send cash from one place to another by messenger or by mail, payment is usually made in one of the following ways:

1. By check sent by messenger or by mail.
2. By postal money order sent by messenger or by mail.
3. By express money order sent by messenger or by mail.
4. By telegraphic money order.

Checks. A written order on a bank to pay a person a sum of money is called a **check.** A check must be indorsed before it can be cashed. (See page 174.)

1. How does a check differ from a note?
2. What names are mentioned on the face of a check?
3. What items must be filled out on every check?
4. How is a record kept of all checks paid out?
5. What must be done when transferring a check?
6. What is the effect of an indorsement?
7. What makes a check negotiable?
8. What is a certified check?
9. Why is payment by checks a safe method?
10. Write a check in payment of your gas bill.

Postal Money Order. An order in writing made by a postmaster in one place on a postmaster in another place to pay the person mentioned a specified sum of money is called a **postal money order.**

As this is practically a check issued by the United States government, it is a very safe method of sending money. However, it is more expensive than sending a check, as the government charges a fee for every money order. Any person desiring to make payment in this way fills out an application in any post office, and pays the postmaster or postal clerk the face of the money order plus the fee charged for service ren-

dered. The purchaser may send the money order to the payee by messenger or by mail with perfect safety. The payee must indorse it before he can have it cashed. As it is negotiable, he need not apply to the post office of his town but may have it cashed by any one, provided it is indorsed.

Application for Domestic Money Order

Spaces below to be filled in by purchaser, or, if necessary, by another person for him.

Amount _____*Nine*_____ Dollars ____*50*____ Cents

Pay to Order of _____*Arthur Grant*_____
(Name of person or firm for whom order is intended)

Whose Address is No. *154 West 70* Street

Post Office _____*New York*_____

State _____*N. Y.*_____

Sent by _____*Alfred Weeks*_____
(Name of Sender)

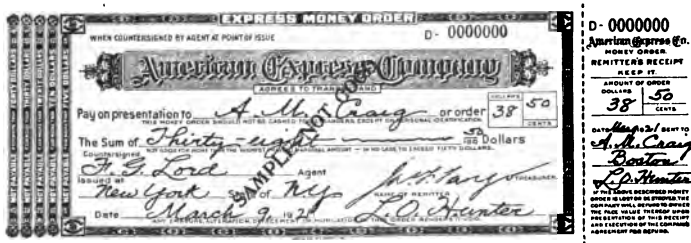
Address of sender No. *540 West 150* Street

PURCHASER MUST SEND ORDER AND COUPON TO PAYEE

The following are the postal money order rates:

Under $ 2.51	3¢	From $30.01 to $ 40	15¢
From $ 2.51 to $ 5	5¢	40.01 to 50	18¢
5.01 to 10	8¢	50.01 to 60	20¢
10.01 to 20	10¢	60.01 to 75	25¢
20.01 to 30	12¢	75.01 to 100	30¢

The largest amount for which any one postal money order may be issued is $100.



Express Money Orders. An express money order is similar to a postal money order. It is issued by an express company and can be purchased from the local agent of the express company. It is payable from the funds of the express company on deposit in various banks mentioned in the order. As it is negotiable, it may be cashed anywhere if indorsed. Banks will accept express money orders from depositors. The rates are the same as those charged for postal money orders.

No express order is issued for a sum larger than $50. If larger sums are to be sent, additional orders must be purchased.

Telegraphic Money Orders. A telegraphic money order is issued by telegraph companies and is used when immediate payment is necessary. This is a more expensive method than that of sending money by postal or express money order. If a person in New York desires to pay a person in Chicago a sum of money at once, he fills out an application at a New York telegraph office and pays the face of the money order plus the charge for service and the cost of a 15-word telegram to Chicago.

The following are the charges that must be added to the charge for a 15-word telegram:

For $25 or less	25¢
$25.01 to $ 50	35¢
50.01 to 75	60¢
75.01 to 100	85¢

[With pencil]

1. Mr. A. Lewis wishes to pay $2.50 for his subscription to the *Saturday Evening Post*. Write his check in payment.

2. How much will it cost him to pay by money order?

3. Which is better, to pay by check or by money order? Why?

4. How much must Ellen pay the postal clerk for a money order for $12.75?

5. The teacher of Class A orders copies of *Current Events* for all pupils in the class. The bill of $2.75 is paid with a postal money order. How much is paid for the money order?

6. Margaret's father plans to spend his vacation in California. He takes with him 8 fifty-dollar express money orders. How much does he pay for them?

7. If it costs $.75 for a 15-word telegram to a certain place, how much will it cost to send a $100 telegraphic money order to that place?

8. What is the charge for a telegraphic money order of $62.50 to a place to which it costs $.65 to send a 15-word message?

9. Our club treasurer desires to send $4.60 to George M. Hall and Company in payment of a bill. The club has no bank account. What do you advise him to do?

10. What will be the total charge for sending $215 by an express money order?

Checks. For information about and exercises on checks, see pages 174–176.

CASH AND PERSONAL ACCOUNTS — REVIEW

(Read the chapter on Cash and Personal Accounts, pages 177–179.)

1. What is meant by a cash account?

2. Write the following accounts, ruling your page properly, and balance each. Supply dates.

a. *Receipts* — Sale of old newspapers and magazines, 20¢; sale of tin foil, 15¢; receipts for running errands, 20¢; allowance from mother, 20¢; gift, 10¢.

Payments — For pencils, 5¢; for theater, 22¢; for candy, 15¢; for toys, 18¢.

b. *Receipts* — On hand from last week, $1.60; from aunt, 25¢; from storekeeper, 25¢; from odd jobs, 80¢; from printer, 15¢.

Payments — Thrift Stamps, 50¢; Red Cross, 25¢; theater, 33¢; candy and toys, 26¢.

3. As treasurer of the Onward Club write the cash account for the following months:

June: *Receipts* — Cash on hand, $17.60; dues, $8.40; gifts, $3.20; entertainments, $9.75.

Payments — Printing, $1.80; stationery, $1.20; refreshments, $3.00; badges, $.75.

July: *Receipts* —Cash on hand, —; dues, $7.60.

Payments — Postage, $.50; prizes, $3.50.

Aug.: *Receipts* — Cash on hand, —; dues, $6.50; entertainment, $10.25.

Payments — Refreshments, $4.50; postage $.50.

Problems of the Dress Manufacturer



Mr. L. Goodhart was a manufacturer of skirts and dresses.

1. For one model of dress he used 6 yd. of cloth @ \$2.50, 3 yd. of lining @ \$.60, and findings, \$.50. The labor cost per dress was \$3.20. At what price did he sell a dozen dresses if he made a profit of 75%?

2. How many yards of cloth did he need for 24 doz. dresses of this model? how many yards of lining?

3. Petticoats, Lot No. 210, each required $5\frac{3}{8}$ yd. of taffeta silk at \$2.40 a yard, $5\frac{3}{8}$ yd. of insertion at \$.32 a yard, and findings, \$.38. The labor on each petticoat cost \$1 and the overhead expenses amounted to 10% of the cost of the material. Find the total cost per petticoat; per dozen petticoats.

4. If the sale price of a dozen petticoats, Lot No. 210, was \$273, what was the per cent of profit?

5. Mr. Goodhart employed a traveling salesman to sell on a commission of 8%. His commission for last year at this rate amounted to \$4800. What was the amount of his sales?

6. On May 5 Mr. John Steers bought a bill of goods amounting to $850; Terms: 6/30, 5/60. He paid with a check on June 2. What was the amount of the check? Write the check.

7. Mr. A. Lambert bought a lot of goods for $1200 on June 8, paying with a note for the amount, due in 90 days. Mr. Goodhart had it discounted July 1 at 6%. How much did he receive for it?

8. Mr. Goodhart imported from France 20 pieces of dress silk, each 15 yd. long, valued at 3 francs per yard. After paying a duty of 60% on them, what was the total cost in United States money? (Use the approximate normal value.)

9. Last October he found it necessary to borrow money from his bank. He gave his note for $4000, dated Oct. 9, due in 3 mo., which the bank immediately discounted at 6%. How much did he get for the note?

10. His total sales for the year amounted to $150,000. If his net profits amounted to $8\frac{1}{8}\%$ of the total sales, what were his net profits?

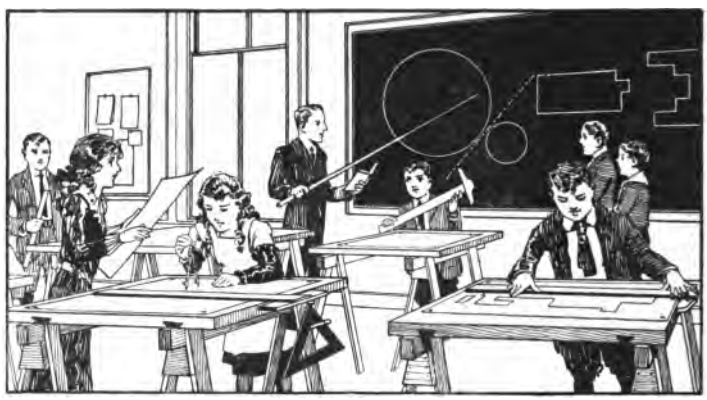
11. At the end of the year he took inventory and found he had $120\frac{1}{2}$ yd. of odd pieces of silk which he could no longer use. This silk had cost him $2.40 a yard. He sold all at a loss of $12\frac{1}{2}\%$. How much did he receive for it?

12. If he sold all his goods on terms of 7/10 or 5/30, how much was the discount allowed on the following bills, paid within 10 da.?

a. $1\frac{1}{2}$ doz. skirts @ $180
$\frac{3}{4}$ doz. dresses @ $120

b. 2 doz. petticoats @ $ 90
$1\frac{1}{6}$ doz. dresses @ $150

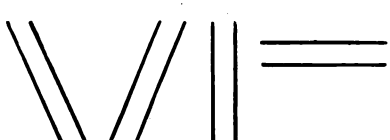
MEASUREMENTS



The measuring of lines, surfaces, and solids is called **mensuration.**

Lines

A line has but one dimension, length. Lines that are equally distant from each other, and that will never meet, no matter how far extended, are called **parallel lines.**



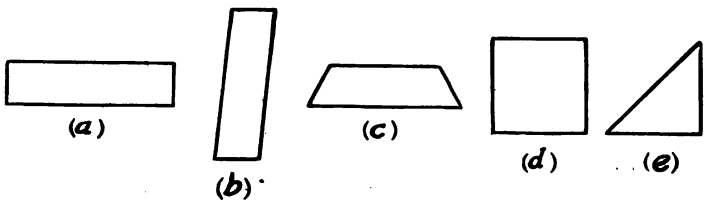
1. Name several objects in your room that have parallel lines.

2. Show which lines are parallel on this page; on your blackboard; on the door.

3. Draw two parallel lines one inch apart.

4. Draw four parallel lines $\frac{1}{2}$ inch apart.

5. Tell which of these figures have parallel lines:



Angles

When two straight lines meet they form an **angle.**

The following are illustrations of angles:



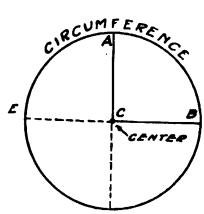
The angle is the amount of opening between the two straight lines that meet.

The size of the angle depends on how far apart the lines are.

We measure angles in **degrees.** The symbol for degree is °. Thus, 90° means 90 degrees.

When you studied the shape of the earth you learned that there are 360° in the circumference of a circle.

In the figure of the circle, the angle ACB, formed by the lines AC and CB, is 90° because it is one fourth of the circle.



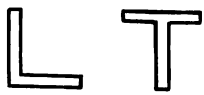
An angle of 90° is called a **right angle.**

Name three other right angles in this figure.

Two lines forming a right angle are said to be **perpendicular** to each other.

Thus, line AC is perpendicular to line CB, and to line EC.

To draw right angles and perpendicular lines, carpenters often use instruments called squares or T squares, shaped like the letter L or the letter T.



Have you ever used either of these instruments in the workshop of your school?

Any angle less than a right angle (less than 90°) is called an **acute** (sharp) **angle.**

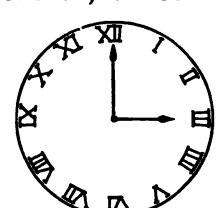
Any angle greater than 90° and less than 180° is called an **obtuse** (blunt) **angle.**



1. Draw an angle of 90°.

2. Draw an angle of 60°; of 30°; of 45°; of 120°; of 150°.

3. Name each of the angles you drew in example 2.



4. What time is it when the hour hand is at 3 and the hands of the clock make an angle of 90°?

5. What kind of angle is made by the hands of a clock at five o'clock? at ten o'clock? at 3.40 o'clock? at 2.15 o'clock?

Surfaces

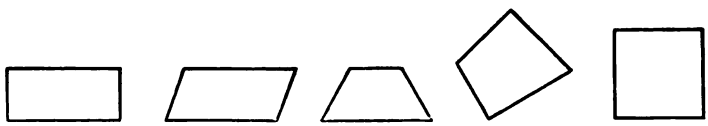
A surface has two dimensions, length and breadth (width). The amount of surface of any figure is called its **area.**

A surface such that a straight line joining any two points of it lies wholly in the surface is called a **plane surface.**

The common plane figures are the quadrilateral, the triangle, and the circle.

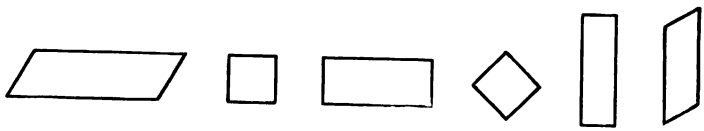
A **quadrilateral** (quadri = four, lateral = side) is a plane figure having four sides.

The following drawings represent quadrilaterals:



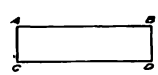
Quadrilaterals whose opposite sides are parallel are called **parallelograms.**

The following drawings represent parallelograms:



A parallelogram whose angles are all *right angles* is called a **rectangle** (rect = right).

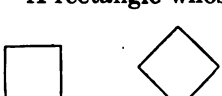
In the rectangle represented at the right, line CD is called the **base.**



Line BD or AC is called the **altitude** (height, width). It must be perpendicular to the base.

The **altitude** of a parallelogram is its height measured on a line perpendicular to the base.

A rectangle whose sides are equal is called a **square.**



The drawings at the left represent squares.

1. Is a square a parallelogram? Give a reason for your answer.

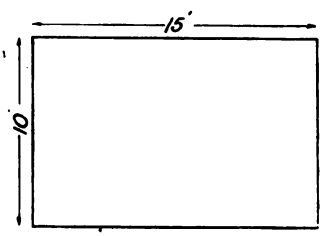
2. Is every square a rectangle? Why?

3. Name something in your classroom having the shape of a parallelogram; of a square; of a rectangle.

4. What is the shape of your handkerchief? of your book? of a baseball diamond? of a tennis court? of a basketball court? of a city block?

Drawing to Scale

This is a *plan* of a room 10 ft. wide and 15 ft. long. This plan is drawn to the *scale* of 10 ft. to 1 in. Each inch in the length of the plan stands for 10 ft. in the length of the room, and each inch in the width of the plan stands for 10 ft. in the width of the room. The width of this plan is therefore 1 in. (or 1″) and the length of this plan is $1\frac{1}{2}$ in. (or $1\frac{1}{2}$″).



Let 1 inch stand for 1 foot, and draw figures to represent:

1. A window 3 ft. wide and 7 ft. high.
2. A blackboard 2 ft. wide and 6 ft. long.
3. A picture frame $2\frac{1}{2}$ ft. wide and $3\frac{1}{2}$ ft. long.
4. A floor 12 ft. wide and 16 ft. long.

Let $\frac{1}{2}$ inch stand for 1 foot, and draw figures to represent:

5. A garden plot 9 ft. wide and 12 ft. long.
6. A rug $3\frac{1}{2}$ ft. wide and $4\frac{1}{2}$ ft. long.
7. A wall 12 ft. wide and $10\frac{1}{2}$ ft. high.

Draw lines to represent the following distances on a scale of 20 yd. to 1 in.:

	a	*b*
8.	65 yd.	$\frac{1}{4}$ mi.
9.	90 ft.	40 rd.
10.	60 rd.	120 ft.

11. Draw on the board or on paper the plan of a cover of a box 3 in. wide and 4 in. long, exact size. What figure is it?

12. Draw on the board or on paper a rectangle representing a door 7 ft. high and 3 ft. wide, to the scale of 1 ft. to 1 in.

13. What shape is the wall of your classroom? Draw a plan of it to the scale of 1 ft. to $\frac{1}{4}$ in.

14. What is the form of the floor of your classroom? Draw a plan of it to the scale of 1 yd. to 1 in.

15. Draw a plan of the windows in the room, using a scale of 1 ft. to $\frac{1}{2}$ in.

16. Draw a plan of a rug 9′ by 12′ on a scale of 12′ to 1″.

Finding Areas

The amount of surface in a figure is called its **area.**

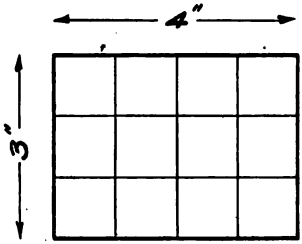
The distance around a figure is called its **perimeter.**

The measure used for measuring surfaces is **square measure.**

Example: How many square inches are there in a rectangle 3 in. wide and 4 in. long?

Work

The unit of measurement is 1 sq. in.
Since there are 4 sq. in. in one row, in 3 rows there are 12 sq. in.
3×4 sq. in. = 12 sq. in., area
Or, 3×4×1 sq. in. = 12 sq. in., area,
Ans.



☞ To find the area of a rectangle, change the length and the width to the same denomination, and then multiply the number of units in the length by the number of units in the width. The product times the square unit will give the area.

The area of a rectangle = base × altitude × unit of measure.

[Use pencil when needed]

Find the areas of the following rectangles:

	a	*b*
1.	20 ft. by 60 ft.	55 yd. by 60 rd.
2.	34 ft. by 48 ft.	15 ft. by $22\frac{1}{2}$ yd.
3.	60 yd. by 80 yd.	48 ft. by $16\frac{1}{3}$ yd.
4.	24 rd. by 72 rd.	44 yd. by 64 rd.
5.	60 ft. by 40 yd.	3 yd. 2 ft. by 12 yd.

To save time, use the cancellation method whenever possible.

Example: Find the area of a field 36 rd. by 60 rd.

WORK

$$\text{Area} = \frac{\overset{3}{\cancel{60}} \times \overset{9}{\cancel{36}} \times 1 \text{ sq. rd.}}{\underset{\cancel{40}}{\cancel{160}} \text{ sq. rd.}} = \frac{27}{2}, \text{ number of acres; } 13\tfrac{1}{2} \text{ acres, } \textit{Ans.}$$

It is well to indicate the solution of the problem before actually solving it. Thus, in the above example we indicate the solution as follows:

$$\text{Area} = \frac{60 \times 36}{160}$$

In the following examples, indicate the solution, then solve.

How many acres are there in a rectangular field:

	a	*b*
6.	40 rd. by 80 rd.?	40 rd. by 100 rd.?
7.	$30\frac{1}{2}$ rd. by 60 rd.?	60 rd. by 80 rd.?
8.	66 yd. by 80 rd.?	72 rd. by 80 rd.?
9.	25 rd. by 132 rd.?	100 rd. by 140 rd.?
10.	77 yd. by 60 rd.?	80 rd. by 176 yd.?

Find the area of:

11. A square field 16 rd. long.

12. A square field 200 yd. wide.

13. A rug 3.5 yd. wide and 5.4 yd. long.

14. A square $4\frac{1}{2}$ ft. in length.

15. A farm 60 rd. square.

16. What is the difference between a field 12 rd. square and a field of 12 sq. rd.?

Give the difference between:

17. 12 sq. ft. and 12 ft. square.

18. 10 sq. yd. and 10 yd. square.

19. 9 sq. rd. and 9 rd. square.

20. 6 sq. in. and 6 in. square.

PROBLEMS [With pencil]

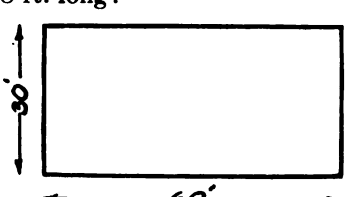
1. A box lid is $3\frac{3}{4}$ ft. wide and $6\frac{1}{2}$ ft. long. How many square feet are there in its surface? how many square yards?

2. At \$80 an acre, how much must be paid for a rectangular strip of woodland 80 rd. wide and 120 rd. long?

3. How much will it cost to cover the floor of a kitchen 10 ft. wide and 12 ft. long with linoleum at \$1.50 a square yard?

4. How many squares of silk, each 6 in. long, are needed to make a bedspread 6 ft. wide and 8 ft. long?

5. How many armbands 1 ft. long and 4 in. wide can be cut from a strip of cloth 12 yd. long and $\frac{3}{4}$ yd. wide?



6. A lawn 30 ft. wide and 60 ft. long was to be filled in with sods of turf 2 ft. square. How many sods were needed?

7. Which is larger, a square field whose length is 50 rd., or a rectangular field 40 rd. by 60 rd.? how much larger?

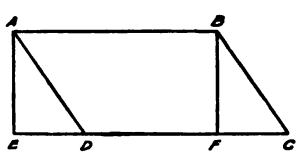
8. A rectangular field has an area of 6 A. and is 180 rd. long. How wide is it?

9. The area of a rectangular field is $\frac{3}{4}$ of an acre. The width is 6 rd. Find the length.

10. A field is 20 rd. wide and its area is 2 A. 120 sq. rd. Find its length.

To find the area of a parallelogram.

Let $ABCD$ be any parallelogram with DC as the base. Draw



BF perpendicular to the base, DC. If you cut off the triangle FBC and place it in the position of the triangle AED, you get a rectangle $ABFE$ having the same base and the same altitude as the given parallelogram.

The altitude of a parallelogram is its height measured on a line perpendicular to the base.

The area of a parallelogram is equal to the product of its base and altitude, expressed in like units, times the unit of measurement.

[Without pencil]

Find the area of each of these parallelograms:

1. Base, 12 ft.; altitude, 10 ft.
2. Base, 20 yd.; altitude, 15 yd.
3. Base, 20 yd.; altitude, 20 ft.
4. Base, 10 rd.; altitude, 5 rd.
5. Base, 12 ft.; altitude, 5 ft. 6 in.
6. Base, 30 yd.; altitude, 10 yd.
7. Base, 60 ft.; altitude, 30 ft.
8. Base, 90 ft.; altitude, 10 yd.

Find the area of: [With pencil]

1. A parallelogram having a base of 100 yd. and an altitude of 60 ft.

2. A parallelogram having a base of 64 rd. and an altitude of 33 yd.

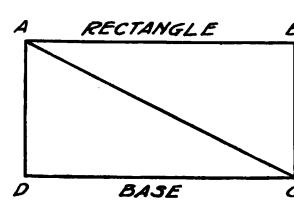
Find the missing dimension of each of these parallelograms:

	Base	Altitude	Area
3.	150 ft.	80 yd.	?
4.	?	24 yd.	7200 sq. ft.
5.	66 yd.	?	9900 sq. ft.
6.	120 rd.	?	12 acres
7.	?	60 rd.	5 acres

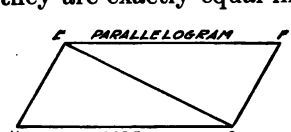
How many acres are there in each of the following parallelograms?

8. Base, 40 rd.; altitude, 6 rd.
9. Base, 16 rd.; altitude, 12 rd.
10. Base, 36 rd.; altitude, 20 rd.
11. Base, 120 rd.; altitude, 32 rd.
12. Base, 64 rd.; altitude, 36 rd.

To find the area of a triangle.



Cut a paper rectangle $ABCD$ and then cut along the diagonal AC. Compare the two parts (triangles) ABC and ACD. You will find that they are exactly equal in area.



Do the same with the parallelogram $EFGH$.

The diagonal of a parallelogram divides it into two equal triangles.

A triangle, therefore, is one half of a parallelogram having the same base and altitude.

Since the area of a parallelogram equals the product of the base and the altitude expressed in like units, times the unit of measurement, the area of a triangle equals half the product of the base and the altitude, expressed in like units, times the unit of measurement.

$$\textit{Area of any triangle} = \frac{\textit{base} \times \textit{altitude} \times \textit{square unit}}{2}$$

Prove the truth of the above formula by folding a rectangular piece of paper along the diagonal, cutting the paper along the diagonal, and matching the two pieces.

Note that *altitude* does *not* mean the oblique side.

[Without pencil]

Find the area of each of these triangles:

	a	*b*
1.	Base, 20 ft.; altitude, 12 ft.	Base, 30 ft.; altitude, 10 ft.
2.	Base, 16 ft.; altitude, 10 ft.	Base, 12 yd.; altitude, 6 yd.
3.	Base, 40 yd.; altitude, 20 yd.	Base, 10 yd.; altitude, 20 ft.
4.	Base, 100 ft.; altitude, 20 yd.	Base, 30 ft.; altitude, 10 yd.
5.	Base, 20 yd.; altitude, 20 ft.	Base, 40 yd.; altitude, 10 ft.

State the missing dimensions of the following triangles:

	Base	Altitude	Area
6.	10 ft.	6 ft.	?
7.	?	12 ft.	240 sq. ft.
8.	40 yd.	?	160 sq. yd.
9.	?	8 yd.	48 sq. yd.
10.	?	36 ft.	7200 sq. ft.

[With pencil]

Find the missing dimension of each of the following triangles. (Be sure to reduce the given dimensions to the same denomination.)

	Base	Altitude	Area
1.	40 rd	30 rd.	? (acres)
2.	150 yd	75 yd.	?
3.	60 rd.	40 yd.	?
4.	36 yd.	60 ft.	?
5.	81 ft.	24 yd.	?
6.	?	36 yd.	640 sq. yd.
7.	?	96 ft.	7200 sq. yd.
8.	60 rd.	?	12 acres

9. Find the area of a triangle whose base is 240 ft. and whose altitude is 64 ft.

10. A piece of property, triangular in shape, has a base of 48 rd. and an altitude of 24 rd. What is its area in acres?

11. A triangular sail on a yacht has an area of 168 sq. ft. and an altitude of 24 ft. Find the length of the base.

12. The base of a triangular sail on a racing yacht is $20\frac{1}{2}$ ft. and the altitude is $8\frac{1}{2}$ ft. Find the area of the sail in square feet.

13. A triangular field has an area of 6 A. and a base of 48 rd. Find the altitude.

14. What is the altitude of a triangular piece of land containing 12 A., the base being 96 rd. long?

15. How many acres are there in a triangular field 240 rd. long, having an altitude of 121 yd.?

16. A piece of sheet metal, triangular in shape, has an area of 294 sq. in. and an altitude of 1 ft. 2 in. Find the length of its base.

17. A triangular plot has an altitude of 88 yd. and a base of 45 rd. Find the area in acres.

Plastering, Painting, Paving, Papering, and Carpeting



Plastering and painting are usually estimated by the square yard.

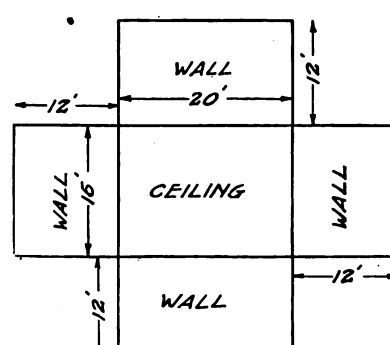
Paving is estimated by the square foot or the square yard.

Papering is estimated by the roll. Wall paper is usually 18 in. wide and is sold in rolls, 24 ft. long (single) or 48 ft. long (double). Fractional parts of a roll are not sold.

Carpet is sold by the linear yard. It is usually $\frac{3}{4}$ yd. wide or 1 yd. wide. Linoleum and oil cloth are usually sold by the square yard.

To find the cost of plastering or painting.

Example : Find the cost of plastering the walls and the ceiling of a room 15 ft. wide, 20 ft. long, and 12 ft. high, at \$.75 per square yard, allowing 80 sq. ft. for windows and doors.



WORK

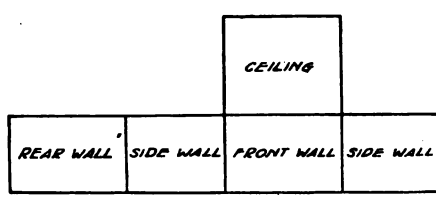
1 ceiling $20' \times 15' = 300$ sq. ft. in area
2 walls $20' \times 12' = 480$ sq. ft. in area
2 walls $15' \times 12' = 360$ sq. ft. in area
1140 sq. ft., total area
Allowance, 80 sq. ft.
1060 sq. ft. to be plastered.

Since 1060 sq. ft. $= \frac{1060}{9}$ sq. yd., the cost of plastering is:

$$\frac{\overset{265}{\cancel{1060}}}{\underset{3}{\cancel{9}}} \times \$\frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{4}}} = \frac{\$265}{3} = \$88\tfrac{1}{3}, \text{ or } \$88.33, \textit{Ans.}$$

To understand this better, try the following:

Take a pasteboard box, slit the edges, and swing all the sides so as to form one continuous strip corresponding to the walls. The result will look like this:



Notice that the four walls make one long rectangle whose total base equals twice the length (front and rear walls) plus twice the width (side walls) of the room, and whose altitude equals the height of the room.

The area of the walls, therefore, equals

$$(2\,L+2\,W)\times H\times \text{square unit}$$

The area of the ceiling equals

$$L\times W\times \text{square unit}$$

The total area to be plastered equals

$$(2\,L+2\,W)\times H\times \text{ square unit} + L\times W\times \text{ square unit}$$

☞ *Do not multiply the dimensions until they are changed to the same denomination.*

[With pencil]

1. A room is 15 ft. wide, 18 ft. long, and 10 ft. high. Find the cost of plastering the ceiling at $.50 a square yard.

2. Find the cost of plastering the walls of this room at $.50 a square yard, allowing for 2 windows 6′×3′.

3. Find the cost of painting the walls and the ceiling of this room at $.20 a square yard.

4. How much does it cost to paint the floor of this room at $.25 a square yard?

5. How many square yards of floor space are there in your classroom?

6. At $.12 a square yard how much does it cost to paint a porch floor 8 ft. wide and 16 ft. long?

7. How many square yards of linoleum are needed for a kitchen floor 12 ft. by 16 ft. 6 in.?

8. Our kitchen is 10 ft. wide and 12 ft. long. How many square yards of linoleum are needed for the floor?

9. Find how many square yards of plaster there are in the walls and ceiling of your classroom; of your dining room.

An apartment of 3 rooms is to be plastered, painted, and calcimined. The following are the dimensions of the rooms:

a. 12′×15′×10′; 2 windows, 3′×6′; 1 door, 4′×7′.

b. 10′×12′×10′; 1 window, 3′×6′; 1 door, 4′×7′.

c. 10′×10′×10′; 1 window, 3′×6′; 1 door, 3′×7′.

10. Find the cost of plastering each room at $.30 a square yard.

11. Find the cost of calcimining each ceiling at $.12 a square yard.

12. Find the cost of painting the walls of each room at $.15 a square yard.

13. Find the cost of varnishing the floor of each room at $.15 a square yard.

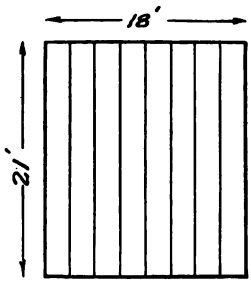
To find the cost of carpeting.

Carpet is usually sold by the yard, in strips. The strips come in any length desired, but dealers *never* sell parts of strips.

In determining the number of yards of carpet for a floor, the number of strips must be known. The number of yards required equals the number of yards there are in 1 strip multiplied by the number of strips.

Strips may run lengthwise or crosswise.

Example: Find the cost of carpeting a room 18′ wide and 21′ long with carpet $\frac{3}{4}$ yd. wide at $1 a yard, strips running lengthwise.



WORK

Since the strips run lengthwise and the carpet is $\frac{3}{4}$ yd. wide, the number of strips required is obtained by dividing the width of the room by the width of the carpet.

18 ft. $\div \frac{9}{4}$ ft. $= 8$ Or, 6 yd. $\div \frac{3}{4}$ yd. $= 8$

Therefore 8 strips are required.

Since each strip is 21 ft., or 7 yd., long, the number of yards of carpet required $= 8 \times 7$ yd. $= 56$ yd.

Cost per yard $= \$1$; $56 \times \$1 = \$56$, cost, *Ans.*

☞ *Remember:*

1. Change the width of the room and the width of the carpet to the same denomination.
2. The number representing the width of the room divided by the number representing the width of each strip of carpet equals the number of strips required.
3. The number of strips required times the number of yards in the length of each strip equals the number of yards required.

[With pencil]

Indicate the solution of each problem; then solve it:

1. Find the number of yards of carpet required for a room 9 ft. wide and 12 ft. long, if the carpet is $\frac{3}{4}$ yd. wide and the strips run lengthwise.

2. Find the number of yards of carpet 1 yd. wide required for the following rooms (strips running lengthwise):

a. 12′×15′	*c*. 15′×17′	*e*. 12′6″×18′
b. 12′×16′	*d*. 10′×16′	*f*. 15′6″×18′6″

3. At \$1.50 a yard find the cost of carpeting a room 14′×15′ with carpet $\frac{3}{4}$ yd. wide, strips running lengthwise.

4. Find the cost of carpeting a room 15′×20′ with carpet $\frac{3}{4}$ yd. wide, at \$1.75 a yard, strips running crosswise.

5. Our dining room is 12′×15′ and our kitchen is 10′4″×12′. Find the cost (*a*) of carpeting the dining room with carpet 1 yd. wide at \$1.60 a yard; (*b*) of covering the kitchen floor with linoleum at \$.50 per square yard.

Review

1. What is the difference between the perimeter of a square 8 ft. long and the perimeter of a triangle each of whose sides is 8 ft. long?

2. What is the area of a rectangle whose base is 15 ft. and whose altitude is 9 ft.?

3. Tags in the form of a rectangle 3″ long and having an altitude of 2″ are to be cut from sheets of paper 4 ft. square. How many such tags can be cut from each sheet?

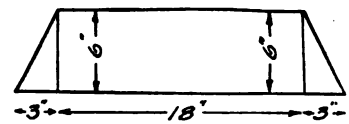
4. What is the number of acres in a field 40 rd. square?

5. What is the cost of inclosing a rectangular field 20 rd. long, containing 240 sq. rd., the cost of fencing being \$.25 a foot?

6. If no allowance is made for waste, how many sheets of paper 6″×9″ can be cut from a roll 3′ wide and 15′ long?

7. At 36¢ a square yard how much will it cost to plaster the sides and ceiling of a room 12 ft. wide, 15 ft. long, and 9 ft. high?

8. Find the area covered by the figure represented in the drawing on the right.



9. If a gallon of paint covers 300 sq. ft., how much will it cost, at $1.50 a gallon, to paint a surface 10′×15′?

10. How many library cards 3″×5″ can be cut from a sheet of cardboard 21″×25″?

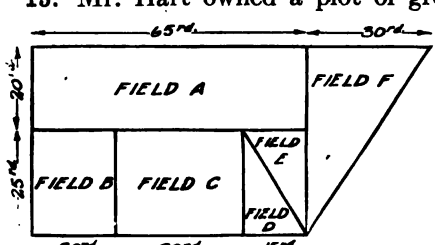
11. How many rectangular cards 3 in. by $2\frac{1}{2}$ in. can be cut from a sheet of cardboard 15″ square?

12. How many square yards of floor will a rug 4 ft. 6 in. wide and 9 ft. long cover?

13. Our class pennant is triangular in shape, having a base of 1 ft. and an altitude of 18 in. How much area would 48 such pennants cover?

14. How much felt must be bought to make 200 such pennants?

15. Mr. Hart owned a plot of ground in the shape of the figure at the left. He divided it into fields *A*, *B*, *C*, *D*, *E*, and *F*. Find the area of each field in square rods and of the entire plot in acres.



On a Farm



1. Mr. Austin bought a 40-acre farm at $600 an acre, paying $10,000 cash and the balance in two equal notes, one due in 3 mo. and the other due in 6 mo., with interest at 6%. What was the total cost of the farm, including interest on the notes?

2. He divided the farm as follows: 20% for peach crops, 30% for apricot crops, 25% for alfalfa, 15% for corn, and the rest for a barn, a house, and a truck garden. How many acres did he use for each crop? for the buildings and truck garden?

3. If the farm was assessed at $18,000 and the tax rate was 18 mills on the dollar, what was his annual tax bill?

4. If the peach crop averaged $6\frac{1}{2}$ tons per acre, the apricot crop, $8\frac{1}{2}$ tons per acre, the alfalfa, $4\frac{1}{2}$ tons per acre, and the corn, 50 bu. per acre, how much of each crop did the farm yield?

5. If the peaches were sold at $32 per ton, the apricots at $38 per ton, the alfalfa at $18.25 per ton, and the corn at $1.60 per bushel, how much was the entire crop worth?

6. If all the crops were sold through a commission merchant on a commission of 5%, how much commission was paid?

7. A triangular patch of the truck garden was used for raising lettuce. If the base of this patch was 18 yd. and the per-

pendicular was 20 yd., how many lettuce heads were raised, allowing 1 sq. ft. for each head?

8. Mr. Austin bought a tractor listed at \$1200, less 10% and 5%. How much did he pay for the tractor?

9. He had the land plowed with this tractor. If the tractor plowed 8 A. a day at a cost of \$12.50, how long did it take to plow the land used for raising crops (not including the truck garden), and how much did the plowing cost?

10. How many tons of dried fruit could be made from 52 T. of green peaches, if 5 T. of green fruit make 1 T. of dried fruit?

11. If dried peaches were worth \$.15 a pound and the drying cost \$9.50 per ton of green fruit, how much would Mr. Austin's peach crop yield him after he had paid for having it dried?

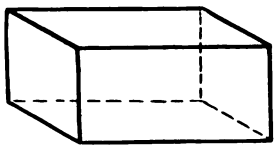
12. Dried apricots were sold at \$.12 a pound and pits at \$35 a ton. How much did Mr. Austin receive for 75 T. of apricots, if he had them dried and pitted? (15 T. of green fruit yielded 1 T. of pits; 5 T. of green fruit yielded 1 T. of dried fruit.)

13. How much did it cost Mr. Austin to irrigate the part of the ranch used for the various crops (90% of 40 A.) if it required 2000 cu. ft. of water per acre at $1\frac{1}{2}$¢ per 100 cu. ft., the services of one man for 4 da. at \$2.75 per day, and the services of another man for 4 nights at \$3 per night?

14. Mr. Austin paid $7\frac{1}{2}$¢ a box for picking peaches. What was the average number of boxes picked per day by a man who earned \$30 in a week of 6 working days?

15. If the ranch was 80 rd. long, how wide was it? Draw a plan of the ranch to the scale of 20 rd. to 1 in., marking off the peach, apricot, alfalfa, and corn acreage.

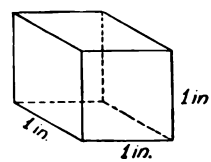
Solids



All solids have three dimensions: length, breadth, and height (depth or thickness).

A solid that is bounded by six rectangles is called a **rectangular solid.**

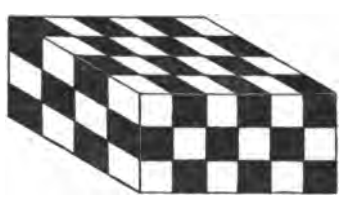
The six rectangles are called the **faces** of the solid.



A rectangular solid having six equal squares for faces is called a **cube.**

To find the volume (contents) of rectangular solids.

Example: Find the volume of a rectangular solid 6 in. long, 4 in. wide, and 3 in. deep.



WORK

The unit of measurement is 1 cu. in. Since we can place 6×4 such cubic inches on the base, in the entire solid we can place $3\times6\times4$ such cubes. Therefore,

Volume $=3\times6\times4\times1$ cu. in.
$=72$ cu. in., *Ans.*

Volume = length × width × height × unit of measure

[Use pencil when needed]

Find the volume of these rectangular solids:

	a	*b*
1.	$6''\times6''\times4''$	5 ft. × 2 ft. × 10 in.
2.	$12''\times12''\times10''$	6 ft. × 5 ft. × 36 in.
3.	$4'\times2'\times6'$	10 ft. × 2 yd. × 6 in.
4.	$8'\times10'\times5'$	2 yd. × 1 ft. × 15 in.
5.	2 yd. × 5 yd. × 3 yd.	6 yd. × 5 ft. × 2 ft.

☞ *Make sure that you know your tables. Be careful to note the dimensions given.*

Check all work to test the correctness of your answers.

Find the contents of these rectangular solids:

6. 6 ft.×4 ft.×2 ft. 8 in.
7. 3 ft.×5 ft. 6 in.×4 ft. 4 in.
8. 10 ft.×6 ft. 6 in.×4 ft. 3 in.
9. 4 yd.×4 ft. 6 in.×30 in.
10. 2 yd.×2 yd. 1 ft.×4 ft. 6 in.

Find the volume of:

11. A cube 6 in. long.
12. A cube 4 ft. 6 in. long.
13. A cube 10 ft. wide.
14. A cube 18 in. long.

PROBLEMS [With pencil]

1. A cubical box, 15 in. on each edge, is filled with one-inch cubes of sugar. How many cubes of sugar does it contain?

2. A rectangular bin is 6 ft. long, 4 ft. 6 in. deep, and 3 ft. 3 in. wide. Find its cubical contents.

3. How many cubic inches are there in a brick 8 in.×4 in. ×$2\frac{1}{2}$ in.?

4. What is the volume in cubic feet of a room 12 ft. wide, 15 ft. long, and 10 ft. high?

5. How many cubic yards of earth must be removed to dig a ditch 4 yd. long, 2 yd. wide, and 1 yd. 1 ft. deep?

6. A packing box is 4 ft. square and 24 in. deep. What are its cubical contents?

7. A cord of wood is 8 ft. long, 4 ft. wide, and 4 ft. deep. How many cubic feet of wood are there in 28 cords of wood?

8. A brick is 8 in.×4 in.×2 in. How many bricks are there in a cubic foot of bricks?

9. How many flower boxes 2 ft. long, 9 in. wide, and 9 in. deep can be filled with a cubic yard of earth?

10. How many blocks of ice 3 ft. long, 2 ft. wide, and 9 in. thick can be cut from a strip of frozen lake 150 ft. long, 60 ft. wide, and 3 ft. deep, allowing for no waste?



11. A cubical box is 18 in. long. How many pieces of soap 2 in. square and $1\frac{1}{2}$ in. thick can be packed therein?

12. How many cubic feet of water are required to flood a rectangular field 100 ft. wide and 125 ft. long to a depth of 10 in.?

13. How many boxes 6 in.×3 in.×3 in. are needed to fill a box 4 ft.×1 ft.×6 in.?

14. How many blocks of ice 2 ft. long, $1\frac{1}{2}$ ft. wide, and 1 ft. thick can be cut from a pond of ice 240 ft. long, 80 ft. wide, and 4 ft. thick, allowing for no waste?

15. What is the capacity in cubic feet of an ice house rectangular in shape, 40′×60′×30′?

16. How many boxes 6 in. square and 9 in. deep can be packed in a cubical box 1 yd. deep?

17. How many cubes 6 in. long will be required to fill a cubical box 4 ft. long?

18. If 50 pupils can be seated comfortably in a room 20 ft. wide, 22 ft. long, and 15 ft. high, how many cubic feet of air are allowed for each pupil?

19. How many cubic feet of ice can be stored in my ice box, which is 2 ft. long, 3 ft. wide, and 1 ft. 4 in. high, if $\frac{1}{3}$ of the space is allowed for the ice?

20. How many 2-inch cubes are needed to make a solid 2 ft. long, 8 in. wide, and $\frac{2}{3}$ ft. high?

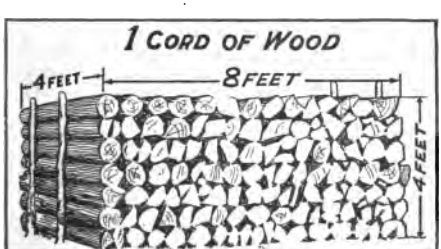
21. If a cubic foot of water weighs $62\frac{1}{2}$ lb., what is the weight of the water in a tank 5 ft. $\times$ 3 ft. $\times 2\frac{1}{2}$ ft., when full?

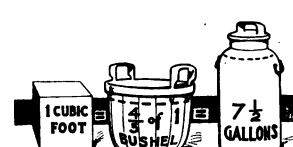
22. If a cubic foot of coal weighs 52 lb., how many tons of coal are there in a bin 10 ft. long, 8 ft. wide, and 14 ft. deep?

Practical Applications

Here are some measurements worth knowing. Try to remember them. Refer to them when necessary.

Exact		Approximate		
1 bu.	= 2150.4 cu. in.	1 bu.	= $1\frac{1}{4}$ cu. ft.	
1 gal.	= 231 cu. in.	$7\frac{1}{2}$ gal.	= 1 cu. ft.	
1 cord (cd.)	= 128 cu. ft. (8′ × 4′ × 4′)	$62\frac{1}{2}$ lb.	= 1 cu. ft.	(water)





PROBLEMS [With pencil]

☞ *Read the example carefully. Note what is required and what is given. Check all work to test the correctness of your answers.*

1. A tank is 4 ft. long, 4 ft. wide, and 8 ft. deep. When full, how many pounds of water does it contain?

2. Ice weighs .9 as much as water. How many pounds of ice are there in a cake of ice 3 ft. long, 10 in. thick, and 2 ft. wide?

3. How many bushels of grain can be packed in a bin 4 ft. long, 3 ft. wide, and 28 in. deep? (Use the approximate and the exact equivalents.)

4. An aquarium is 1 ft. 6 in. long, 11 in. wide, and 9 in. deep. Exactly how many gallons of water does it hold when full?

5. Allowing $7\frac{1}{2}$ gal. for each cubic foot, how many gallons will a tank 4 ft. long, 8 ft. wide, and 6 ft. deep hold?

6. How many cords are there in a pile of wood 16 ft. long, 12 ft. wide, and 8 ft. high?

7. How many cords of wood can a wagon 8 ft. long, 6 ft. wide, and 8 ft. deep hold?

8. A vat in the shape of a cube is 7 ft. deep. How many gallons of water can it hold? (Use the approximate equivalent.)

9. How many bushels of potatoes can be stored in a bin 4 ft. $\times 3\frac{1}{2}$ ft. $\times 2\frac{1}{2}$ ft.? (Use the approximate equivalent.)

10. Find the approximate number of bushels that can be contained in a car whose inside dimensions are 28 ft. $\times$ 8 ft. $\times$ 6 ft.

METRIC SYSTEM — REVIEW

(See the chapter on Metric System, pages 58–73.)

1. What system of weights and measures is common in this country?

2. In what other country is this system used?

3. What system of weights and measures is used in nearly all of the European and South American countries?

4. Where did this system originate?

5. Why is the metric system used by scientists everywhere?

6. Why is the metric system a simpler system than the English system?

7. Which system is easier to remember and why?

8. What is the unit of English linear measures?

9. What is the unit of metric linear measures?

10. Compare the two units.

11. Name the unit of:

	(English)	(Metric)
a. Length Measures	_____	_____
b. Liquid Measures	_____	_____
c. Dry Measures	_____	_____
d. Weight Measures	_____	_____

12. Name the prefixes used in the metric system tables to denote units that are smaller than the base units.

13. Name the prefixes used to denote units that are larger than the base unit.

14. What is a millimeter? a decimeter? a centimeter? a hektometer? a dekameter? a kilometer?

15. Which is larger, a kilometer or a mile? What part is one of the other?

16. Which is larger, a yard or a meter? How much larger is it?

17. How is a unit of one denomination changed to the next lower denomination in the metric system? to the next higher denomination?

18. Change 18 m. to decimeters; to dekameters; to centimeters; to hektometers; to millimeters; to kilometers.

[Use pencil when needed]

19. How many centimeters are there in 2 m.?

20. How many decimeters are there in 4 m.?

21. How many millimeters are there in 3 m.?

22. How many millimeters are there in 84 Km.?

23. How many meters are there in 3 Dm.?

24. How many centimeters are there in 2 dm.?

25. How many meters are there in 12 Hm.?

26. How many meters are there in 1600 mm.?

27. How many meters are there in 86 dm.?

Express as meters:

	a	*b*
28.	4 Dm.	16 m. 8 cm.
29.	275 mm.	26 m. 4 dm. 4 cm.
30.	36 cm.	8 Km. 4 Dm. 3 m.
31.	8 Km.	4 Dm. 2 dm. 4 cm.
32.	46.8 dm.	67 m. 18 mm.

33. Reduce 4 Km. 8 m. 2 dm. to centimeters; to millimeters; to decimeters.

34. Change 8.5 m. to kilometers; to centimeters; to decimeters.

35. Change 126 dm. to meters; to kilometers; to centimeters.

36. Add 16 Km., 2 m., 5 dm., 4 Km., 3 dm., and 2 m.

37. What is the difference in meters between 325.6 m. and 2.4 Km.?

38. At the rate of $1.25 a meter, how much must I pay for 450 cm. of cloth?

39. What part of a kilometer are 250 dm.? 250 cm.? 250 m.?

40. What part of a meter are 2.5 cm.? 2.5 dm.? 2.5 mm.?

Change:

	a	*b*
41.	5 mi. to kilometers	50 dm. to feet
42.	100 yd. to meters	60 Km. to miles
43.	4 Km. to yards	75 mm. to inches
44.	20 Km. to miles	150 cm. to inches
45.	2000 m. to yards	1000 yd. to kilometers

46. An airplane rose $2\frac{1}{2}$ Km. How many yards did it rise?

47. The French used a gun with a bore of 155 mm. What was the width in inches?

48. Some of our battleships are equipped with 16-inch guns. How many millimeters wide are they?

49. The Eiffel Tower is 300 m. high. The Woolworth Building is 750 ft. high. Which is taller, and by how much?

50. Marie is 1 m. 3 dm. tall; Alice is 4 ft. 6 in. tall. What is the difference in their heights?

51. An airplane traveled 140 mi. in an hour. How many kilometers did it travel?

52. If silk is bought at 5 francs a meter and sold at $1.50 a yard, what is the profit on 54 m. of the silk? (Use the approximate normal value.)

53. An importer bought 360 m. of silk at 12 francs a meter and sold it at $4.50 a yard. What was his profit?

54. During the World War the 165th Infantry hiked 117 Km. in 8 da. through deep snow. How many miles did they hike on an average per day?

55. How many square decimeters are there in a square meter?

56. What is an are?

57. What part of an are is a square meter?

58. About how many ares are there in an acre?

59. What is a hektare?

60. How many acres are there in a hektare?

61. How is land measured in France?

Reduce to square meters:

	a	*b*	*c*
62.	45 sq. dm.	46 sq. Hm.	.8 are
63.	18 sq. dm.	16 sq. Km.	16.5 sq. dm.
64.	120 sq. cm.	10 ares	1.2 sq. dm.

65. Change to square centimeters: 8 sq. m.; 3.2 sq. dm.

66. Change to square decimeters: 14 sq. m.; 3 sq. Dm.

67. How many square centimeters are there in 12 sq. Km.? in 12 sq. dm.?

68. If land is worth $500 an are, what is the value of a strip of land 40 m. wide and 100 m. long?

69. A field is 20 m. square. What is its area in square meters? in ares? in acres?

70. How many acres are there in a plot of ground containing 12 hektares?

71. A field, rectangular in shape, is 4 Km. long and 1 Km. 100 m. wide. Find its area in square meters; in ares; in acres.

72. A rectangle is 4.5 Hm. long and 3.8 Hm. wide. Find its area.

73. How many acres are there in a square 100 meters long?

74. Which has the larger area, and how much larger?

a. A square 2 dm. 5 cm. long.

b. A triangle with a base of 3 dm. and an altitude of 3 dm.

75. A rectangle is 28 cm. wide and 45 cm. long. Find the area in square meters; in square yards. (1 sq. m. = 1.196 sq. yd.)

76. What is a liter?

77. Which is greater, a liter or a quart?

78. How many liters of water can a box containing 1 cu. m. hold?

79. A cube is 1 dm. long. How many cubic centimeters does it contain?

80. If hollow, how many liters can this cube hold?

81. How many cubic meters are there in 250 cu. dm.?

82. How many cubic decimeters are there in 5 cu. m.?

83. A tank contains 20 cu. m. How many liters can it hold?

84. An aquarium is 5 dm. long, 5 dm. wide, and 2 dm. deep. How many liters of water can it hold? about how many gallons?

85. A cask holds 3 Hl. 1 Dl. 2 l. of oil. How much is the oil worth at $.75 a liter?

Change:

	a	*b*
86.	10 l. to quarts (liq.)	5 gal. to liters
87.	30 l. to gallons	4 gal. 2 qt. to liters

88. A box measures 4 dm. on each side. How many liters of corn will it hold?

89. A block of marble is 2 m. long, 1 m. 5 dm. wide, and 2 m. thick. What is its value at $40 a cubic meter?

90. At $.12 a cubic meter, how much will it cost to dig a cellar 10 m. × 12 m. × 2 m. 5 dm.?

91. A dealer bought 40 hektoliters of oil for $1000 and sold it at $.30 a half liter. What was his profit?

92. An importer paid 750 francs for 25 Dl. of wine and sold it at $6 a gallon. Find the gain, using the approximate normal value of the franc.

93. How many liters of sand will fill a box 10 dm. long, 40 cm. wide, and 20 cm. deep?

94. How many cubic meters are there in a tank holding $437\frac{1}{2}$ l. when full?

95. What is the unit of metric weight?

96. What metric measure is used for weighing a person? apples? medicine? precious stones?

97. What metric measure is used for weighing coal?

98. What is a kilo? About how many pounds equal a kilo?

99. What is the weight of a liter of water?

100. What is the weight of a cubic centimeter of water?

101. How many pounds are there in a metric ton?

102. What is the weight of a cubic meter of water?

103. Find the weight in pounds of a person weighing 84 kilos.

104. During the World War one of the motor lorries carried 500 l. of water on one of its trips to the front. How many pounds of water did it carry?

105. Mercury weighs 13.6 times as much as water. What is the weight of 25.5 cu. cm. of mercury? of 2 l. of mercury?

106. A tank is 2 m. by 3.5 m. by 1.5 m. How many kilograms of water can it hold?

107. A cubical box is 1 m. long and is filled with stone which weighs 2.7 times as much as water. What is the weight of the stone in this box?

108. How many kilograms are there in a long ton of coal weighing 2240 lb.?

109. A barrel of flour weighs 196 lb. How many kilograms of flour are there in a load containing 20 bbl. of flour?

110. Estimate your weight in kilograms.

111. How many kilos does a hektoliter of water weigh?

112. While touring France, Mary's sister bought 2 m. 5 dm. of lace at the Louvre, Paris. How many yards did she buy?

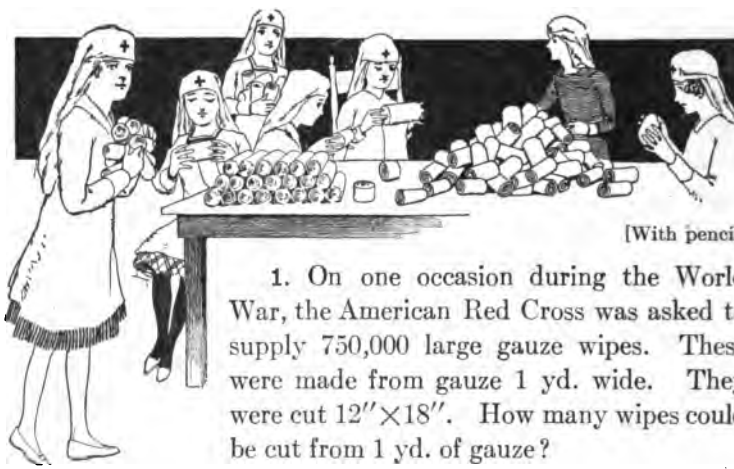


113. It took her 4 hr. 30 min. to travel 80 Km. by train from Paris to her cousin's home. How many miles per hour did the train travel?

114. She paid 22 francs for 2 kilos of chocolate. How much did she pay per pound in our money? (Use the approximate normal value.)

115. When in Italy, her father bought 4 Hl. 5 l. of olive oil at 2 lire a liter. How much did he pay for the oil in United States money? (Use the approximate normal value of a lira.)

Our American Red Cross



[With pencil]

1. On one occasion during the World War, the American Red Cross was asked to supply 750,000 large gauze wipes. These were made from gauze 1 yd. wide. They were cut 12″×18″. How many wipes could be cut from 1 yd. of gauze?

2. How many yards of gauze were needed for this entire order?

3. If gauze cost 6¢ a yard, how much was paid for the material for the 750,000 gauze wipes? for the material for 100 gauze wipes?

4. How many gauze wipes could be supplied with each dollar membership fee?

5. How many Junior Red Cross membership fees (25¢ each) were required to provide 1000 gauze wipes? to provide the 750,000 wipes?

6. If one wipe could be folded in 5 min., how many could be made by 25 workers in 5 hr. 20 min.?

7. If each worker worked 4 hr. and averaged one wipe every 5 min., how many workers did it take to make the 750,000 wipes?

8. The Red Cross supplied 200,000 gauze rolls in one shipment. Each roll was 5 yd. long and 4 in. wide. How many

gauze rolls could be cut from a roll of gauze 100 yd. long and 1 yd. wide?

9. What per cent is each small roll of the whole roll (100 yd. $\times$1 yd.)?

10. At 6¢ a yard, how much did the whole 200,000 rolls cost?

11. How many Junior Red Cross memberships were required to provide 1500 comfort bags, each costing $1.25?

12. The membership of the Red Cross on May 10, 1917, was 486,394, while in January, 1918, after the Christmas Drive, it was 22,000,000. Find, to the nearest tenth per cent, the per cent of gain in membership.

13. Of the 22,000,000 members, 90% belonged to the annual or $1 class, $7\frac{3}{4}$% belonged to the magazine or $2 class; $1\frac{1}{4}$% belonged to the contributing or $5 class; $\frac{5}{8}$% belonged to the sustaining or $10 class; $\frac{1}{4}$% belonged to the life or $50 class; $\frac{1}{8}$% belonged to the patron or $100 class. Find the membership of each class.

14. A boy had $80. He spent 25% of his money for War Stamps, and he gave 25% of the remainder to the Red Cross and other funds. He placed what was then left in the bank to be used for buying a Liberty bond. How much did he put in the bank?

15. Our school owned two 100-dollar Liberty bonds (second, third, and fourth issues) presented by the graduates. The interest on these bonds was added to the Junior Red Cross fund. How much was added to the fund in this way each year? (Regard the rate of interest as $4\frac{1}{4}$%.)

16. Our school contributed $524.50 to the Junior Red Cross last year. Of this amount 78% was donated by the pupils. If the school register was 2400, find, to the nearest cent, the average contribution of each pupil.

SEAT WORK FOR SPEED AND ACCURACY

☞ *Check all work to make sure that your answer is correct.*

A. Perform the operations indicated.

B. Make problems of your own, involving each of these operations; as, "How much is $\frac{1}{100}$ of \$58.34?"

[Use pencil when needed]

I.
1. $58.34 \div 100 = ?$
2. $69.2 \div 1000 = ?$
3. $.068 \div 100 = ?$
4. $42.07 \div 10 = ?$
5. $.356 \div 100 = ?$
6. $.6 \div 1000 = ?$
7. $65.5 \div 500 = ?$
8. $49 \div 400 = ?$
9. $1728 \div 1200 = ?$
10. $.75 \div 5000 = ?$

II.
1. $.6 \times .08 = ?$
2. $5.2 \times .4 = ?$
3. $8 \times 1.6 = ?$
4. $3.4 \times .01 = ?$
5. $2.4 \times 1.5 = ?$
6. $.08 \times .003 = ?$
7. $.8 \times .09 = ?$
8. $5.6 \times .0002 = ?$
9. $2.4 \div .08 = ?$
10. $.049 \div .7 = ?$

III.
1. $1660 \div 25 = ?$
2. $14.4 \div 12\frac{1}{2} = ?$
3. $1260 \div 50 = ?$
4. $81 \div 33\frac{1}{3} = ?$
5. $2.4 \div 16\frac{2}{3} = ?$
6. $3.05 \times 1000 = ?$
7. $16.8 \times 100 = ?$
8. $24.6 \times 50 = ?$
9. $45.6 \times 25 = ?$
10. $124 \times 125 = ?$

IV.
1. $.096 \div .8 = ?$
2. $2.715 \div .03 = ?$
3. $\frac{3}{5}$ of $2.05 = ?$
4. $1.8 \times .5 = ?$
5. $2.8 \times 50 = ?$
6. $16.4 \times .75 = ?$
7. $8.4 \times 1.25 = ?$
8. $.0045 \times .09 = ?$
9. $5.624 \div .08 = ?$
10. $16 \div 12\frac{1}{2} = ?$

V.

1. $\frac{5}{8}+1\frac{1}{2}-\frac{3}{4}=?$
2. $\frac{3}{4}+\frac{7}{8}-\frac{1}{2}=?$
3. $5\frac{1}{2}-3\frac{1}{4}+3\frac{7}{16}=?$
4. $24\frac{3}{8}\times 16=?$
5. $\frac{7}{16}\times 2\frac{2}{3}\times 3\frac{3}{8}=?$
6. $3\frac{1}{2}\div 3\frac{1}{7}=?$
7. $\frac{7}{15}\div 5=?$
8. $\frac{\frac{3}{4}+\frac{3}{16}}{3\frac{2}{3}\times\frac{3}{8}}=?$
9. Change to decimal fractions: $\frac{3}{4}$, $\frac{7}{15}$, $\frac{18}{25}$, $\frac{9}{14}$.
10. Change to common fractions: .12, .0725, .125.

VI. Write as per cents:

1. $\frac{3}{4}=$ ——%
2. $\frac{7}{8}=$ ——%
3. $\frac{5}{6}=$ ——%
4. $\frac{1}{20}=$ ——%
5. $\frac{3}{5}=$ ——%
6. $\frac{8}{9}=$ ——%
7. $\frac{4}{5}=$ ——%
8. $\frac{5}{8}=$ ——%
9. $\frac{1}{25}=$ ——%
10. $\frac{2}{3}=$ ——%

VII. Write as decimals:

1. 25%
2. $3\frac{1}{4}$%
3. 135%
4. 1.6%
5. $\frac{1}{8}$%
6. 350%
7. $\frac{3}{5}$
8. $\frac{2}{3}$%
9. .5%
10. .00$\frac{1}{5}$%

VIII. Find:

1. 7% of \$400
2. 6% of \$5000
3. $2\frac{1}{2}$% of \$1000
4. $1\frac{1}{4}$% of \$240
5. 5% of \$.40
6. $12\frac{1}{2}$% of \$240
7. $\frac{3}{4}$% of \$36
8. 75% of \$36
9. .3% of \$2000
10. $\frac{1}{8}$% of \$1200

IX. Find the value of x:

1. $3\frac{3}{4}\,x=30$
2. $.12\,x=\$36$
3. $.73\,x=219$
4. $.06\,x=\$2.40$
5. $4\frac{1}{2}\%\,x=\$180$
6. $2\frac{1}{2}\%\,x=\$20$
7. $16\,x=24$
8. $28\,x=36$
9. $96\,x=40$
10. $56\,x=42$

X. Find the missing terms:

	Cost	Rate of Gain	Rate of Loss	Gain	Loss	Selling Price
1.	$ 50	6%	—	?	—	?
2.	$250	—	10%	—	?	?
3.	$300	?	—	$ 50	—	?
4.	?	8%	—	$240	—	—
5.	—	—	?	—	$60	$240
6.	—	?	—	$ 30	—	$ 90
7.	?	—	$2\frac{1}{2}$%	—	$30	?
8.	?	—	25%	—	?	$120
9.	?	20%	—	—	—	$360
10.	$120	—	?	—	—	$ 75

XI. Find the interest on:

1. $200 for 6 mo. at $3\frac{1}{2}$%.
2. $450 for 8 mo. at 4%.
3. $960 for 90 da. at 6%.
4. $360 for 3 mo. at $4\frac{1}{4}$%.
5. $700 for 6 mo. at $4\frac{3}{4}$%.
6. $500 for 4 mo. 15 da. at 6%.
7. $2000 for 8 mo. 10 da. at 4%.
8. $1600 from July 9, 1919 to Sept. 5, 1920 at 5%.
9. $3200 from Oct. 5, 1919 to July 20, 1921 at 4%.
10. $1400 from Aug. 10, 1919 to Dec. 24, 1920 at 6%.

XII. Find the areas of the following rectangles:

1. 30 ft. by 40 ft.
2. 25 yd. by 35 yd.
3. 15 rd. by 20 rd.
4. 2 ft. by 3 yd.
5. 11 in. by 3 ft.
6. 15 ft. by 2 rd.

Find the areas of the following triangles:

7. Base, 40 yd.; alt., 30 ft.
8. Base, 24 ft.; alt., 16 ft.
9. Base, 2 ft.; alt., 11 in.
10. Base, 3 yd.; alt., 2 ft.

XIII. Change:

1. 4 m. to millimeters
2. 20 dm. to meters
3. 15 cm. to meters
4. 3 Km. to miles
5. 4 mi. to kilometers
6. 5 Kg. to pounds
7. 300 lb. to kilos
8. 20 francs to dollars
9. £3 5*s*. to dollars
10. 400 lire to dollars

XIV. Find the day of maturity of a note dated:

1. July 19, due in 3 mo.
2. Apr. 6, due in 90 da.
3. Sept. 12, due in 60 da.
4. Oct. 15, due in 4 mo.
5. May 9, due in 45 da.
6. Aug. 24, due in 120 da.
7. Jan. 16, due in 30 da.
8. Feb. 9, due in 2 mo.
9. Mar. 20, due in 90 da.
10. June 14, due in 3 mo.

XV. Find the term of discount of a note dated:

1. July 20, due in 6 mo., and discounted Sept. 20.
2. May 5, due in 3 mo., and discounted June 9.
3. Aug. 20, due in 4 mo., and discounted Oct. 15.
4. Apr. 12, due in 90 da., and discounted May 24.
5. Sept. 5, due in 60 da., and discounted Oct. 9.
6. Nov. 20, due in 2 mo., and discounted Dec. 15.
7. Dec. 15, due in 90 da., and discounted Jan. 30.
8. Feb. 16, due in 60 da., and discounted Mar. 24.
9. June 24, due in 3 mo., and discounted Aug. 5.
10. Mar. 13, due in 4 mo., and discounted June 10.

FORTY-MINUTE TESTS

☞ *Remember that only correct answers are acceptable. Check all work to insure accuracy.*

I

[Without pencil]

1. Add 9, 8, 7, 9, 8, 6, 6, and 9.
2. $\frac{1}{2}+\frac{3}{4}=?$
3. $12\div\frac{6}{7}=?$
4. $18\div\frac{3}{5}=?$
5. $16.5\div10=?$
6. $3.46\times1000=?$
7. $1\frac{1}{2}\times50=?$
8. $\frac{1}{2}$ is what % of 2?
9. $\frac{3}{5}$ of $75=?$
10. $\frac{2}{3}\times\frac{9}{10}=?$

II

[With pencil]

1. Add 482, 946, 782, 857, and 938.
2. $9\times12\times14\div42=?$
3. $.75\div\frac{3}{5}=?$
4. $9\frac{1}{4}-4\frac{5}{16}=?$
5. $425\div\frac{5}{6}=?$
6. Add 93.056, 2.57, and 856.2.
7. $4590.062-388.997=?$
8. $.56\times.075\times3.24=?$
9. $.86\div.043=?$
10. $\frac{4}{5}\times\frac{3}{4}\div\frac{2}{3}=?$

III

[Without pencil]

1. $\frac{3}{4}$ of 20, $+5$, $\div4$, $\times6$, $-10=?$
2. The selling price is \$20; the gain is \$5. Find the rate of gain.
3. The selling price is \$30; the loss is \$10. Find the rate of loss.
4. The sales are \$10,000; the rate of commission is $2\frac{1}{2}\%$. Find the commission.
5. $30\times.005=?$

[With pencil]

6. $4.98 \div .63654 = ?$

7. Add $14\frac{2}{3}$, $21\frac{5}{6}$, $18\frac{3}{4}$, and $56\frac{5}{8}$.

8. How much is gained by selling a house that cost \$30,000 at a gain of 15%? How much is received for the house?

9. What per cent is gained by manufacturing hats at \$1.25 each, and selling them at a gain of \$3.00?

10. What per cent is lost by buying shirts at \$1.50 each, and selling them at \$1.30 each?

IV

[Without pencil]

1. How much is $\frac{2}{3}\%$ of \$300?

2. The selling price is 25¢, and the loss is 25¢. Find the loss per cent.

3. What is the duty on 100 lb. of macaroni, at 1¢ per pound?

4. How much American money can I get for £20 10*s*.? (Use the approximate normal value.)

5. What commission does an agent receive for selling \$5000 worth of goods on a commission of 10%?

[With pencil]

6. Find the duty on 100 boxes of raisins valued at \$1.50 a box, each box containing 36 lb., if the rate of duty is 2¢ per pound.

7. A grocer sold tea at \$.55 per pound and gained \$.15. Find the per cent of gain.

8. If 30 A. of land were bought at \$175 an acre and sold at a gain of 32%, what was the total selling price?

9. A lawyer collected 75% of a debt of \$2460 and charged 5% commission on the sum collected. How much did the creditor receive?

10. Two machines built in England cost £8000 each. Find the cost of both in American money; in French money.

V [Without pencil]

1. What is the 30th day after March 8?

2. How many days are there from Aug. 16 to Oct. 12?

3. How much interest does a 50-dollar Victory bond yield every 6 mo., the rate of interest being $4\frac{3}{4}\%$?

4. A note of \$500 is discounted 2 mo. before it is due at 6%. What is the bank discount?

5. What is the weight of 160 boxes of soap, each weighing 25 lb.?

[With pencil]

6. Find the day of maturity of a 90-day note drawn on March 4.

7. Find the term of discount of a note discounted March 28, and due May 15.

8. Find the bank discount and the proceeds of a note for \$600 drawn March 16, due in 3 mo., and discounted April 15 at 6%.

9. Find the proceeds of a note for \$300 drawn March 15, payable in 90 days, and discounted May 2 at 5%.

10. Write the above note.

VI [Without pencil]

1. A dealer sold silk at \$4 a yard and gained $33\frac{1}{3}\%$. How much did the silk cost him?

2. A pane of glass is 8 in. wide and 12 in. long. What is its area?

3. A 60-day note for \$1000 was discounted the day it was drawn at 6%. What was the bank discount?

4. A triangle has a base of 8 in. and an altitude of 6 in. How much surface does it cover?

5. How many days are there from March 25 to May 11?

[With pencil]

6. A horse was sold for $20 less than it cost, at a loss of $16\frac{2}{3}\%$. Find the selling price.

7. By selling an article for $6.56 more than he paid for it, a merchant gained 16%. Find the cost of the article.

8. A roof is 26 ft. by 43 ft. How many square feet of tin are required to cover it?

9. A rectangular piece of land is 72 rd. wide and 96 rd. long. How many acres are there in its area?

10. A room having a floor area of $166\frac{2}{3}$ sq. ft. is 16 ft. 8 in. long. How wide is it?

VII

[Without pencil]

1. A garden is $5\frac{1}{2}$ yd. square. What is its perimeter?

2. At $\$.87\frac{1}{2}$ a yard, what is the cost of 40 yd. of cloth?

3. $60 \div .005 = ?$

4. How many miles does a train travel if it covers a distance of 24 Km.?

5. The selling price is $120; the loss is 25%. What is the cost? the loss?

[With pencil]

6. How many square inches of glass are there in the surface of a rectangular paper weight 3 in. wide, 4 in. long, and 1 in. deep?

7. A field is 167 m. square. What is its perimeter?

8. What is the area in acres of a triangular field whose base is 50 rd. and whose altitude is 48 rd.?

9. Find the perimeter of a triangle whose sides are $40\frac{1}{3}$ in., $28\frac{1}{8}$ in., and $5\frac{1}{5}$ in.

10. A real estate dealer sold property for \$5075, gaining $16\frac{2}{3}\%$. How much did the property cost?

VIII

[Without pencil]

1. An agent received \$5 for selling \$150 worth of books. Find the rate of commission.

2. An agent received 3% for selling goods. What was his commission on a sale of \$870?

3. By selling flour at \$7 a barrel, $16\frac{2}{3}\%$ was gained. What was the cost?

4. A note for \$1000 was discounted 1 mo. before it was due, at 6%. Find the proceeds.

5. For how much must sugar that cost 10¢ a pound be sold to gain 20%?

[With pencil]

6. Find the cost of digging a cellar 40 ft. wide, 50 ft. long, and $5\frac{1}{2}$ ft. deep at $\$1\frac{1}{2}$ a cubic yard.

7. Find the area of a triangle whose base is 44 m. and whose altitude is 26 m.

8. Find the base of a triangle whose area is 147 sq. in. and whose altitude is 1 ft. 2 in.

9. A man sold two houses at \$3600 each. On one he gained 25%, and on the other he lost 25%. How much was gained or lost by the entire transaction?

10. A messenger boy got 4% of what he collected, and 75¢ a day in wages. How much did he earn in a week of 6 da. if his collections averaged \$80 for the week?

IX

[Without pencil]

1. A triangular label has a base 4 in. long and an altitude of 4 in. What surface does it cover?

2. By selling an article at a gain of 25%, a man made a profit of $30. What was the cost of the article? the selling price?

3. $125 \times 480 = ?$

4. How many cubic inches are there in a cubical box 3 in. long?

5. How many cubic yards are there in a cart 6 ft. long, 3 ft. wide, and 3 ft. deep?

[With pencil]

6. A milliner bought hat frames at $6.60 a dozen, and trimmed them at a cost of $1.25 each. At what price per hat must she sell them to realize a profit of 75% of the total cost?

7. Olive oil is imported at 85¢ a quart tin. If there are 24 tins to a case, find the total cost, including duty at 30¢ a gallon, on a case of tins.

8. Henry's brother borrowed $1250 from his Building and Loan Association at 6% interest. At the end of 2 yr. 9 mo. he paid his debt. How much interest did he pay?

9. Compasses used in school cost 5*s*. a dozen in England. If the duty is 40%, how much did the school authorities pay for 600 doz. compasses? (Use the approximate normal value.)

10. John skated $6\frac{1}{2}$ mi. and Lawrence skated $8\frac{1}{2}$ Km. within the same time. Who skated the longer distance? how much longer?

X

[Without pencil]

1. A grocer sold butter that cost $.50 a pound for $.60 a pound. What per cent did he gain?

2. Florence bought $4\frac{1}{2}$ yd. of ribbon at \$.10 a yard and paid with \$1. How much change was due her?

3. $48+50+52+95+30+5+70=$?

4. A man had \$360 and spent 25% of it. How much was left?

5. If 4 oranges cost 28¢, find the cost of 12 oranges.

[With pencil]

6. Find the amount of \$450 from June 10, 1919 to Oct. 21, 1920, with interest at 5%.

7. A 4-month note for \$90 was dated April 12 and discounted June 1 at 5%. Find the proceeds.

8. What tax must be paid on property valued at \$50,000 if the tax rate is 4 mills on the dollar?

9. A piano marked \$450 was sold with discounts of 20% and 10%. Find the net cost.

10. An agent sold 80 bbl. of apples at \$4.75 a barrel. His commission was $2\frac{1}{2}$%. How much did he send the owner?

XI

[Without pencil]

1. A dealer bought a chair for \$3 and sold it for \$6. What per cent did he gain?

2. A commission merchant sold \$200 worth of sugar on a commission of $2\frac{1}{2}$%. Find his commission.

3. I lent \$400 for 90 da. at 4%. How much interest should I get?

4. Mary bought 1 doz. lemons at the rate of 3 for 5¢. How much did they cost?

5. What was the selling price of a bushel of nuts sold at 10¢ a quart?

[With pencil]

6. Find the area of a rectangular field $8\frac{1}{2}$ rd. wide and 32 rd. long.

7. A farmer bought 60 sheep at $\$5\frac{1}{2}$ each and sold them all for \$440. What per cent was gained?

8. What sum settled a debt of \$360 lent for 1 mo. 20 da. at 5%?

9. A horse was sold for \$240 at a loss of $66\frac{2}{3}\%$. Find the cost.

10. A 60-day note for \$800, dated May 12, was discounted June 8 at 6%. Find the discount and the proceeds.

XII

[Without pencil]

1. Find the day of maturity of a 30-day note written March 5.

2. At 2.3%, what is the tax on property valued at \$2000?

3. How many cubic feet of air are there in a room $10' \times 15' \times 20'$?

4. A building lot in the shape of a right triangle measures 100 ft. and 50 ft. on the two square sides. Find its area.

5. Give the cost, at \$.11 a square yard, of calcimining a ceiling 5 yd. by 6 yd.

6. $99 \times 350 = ?$

7. What will the commission on 500 baskets of peaches be if they are sold at \$2 each and the rate of commission is 2%?

8. Find the amount of a 6-month note for \$500 at 6% interest.

9. If 9 words are missed in a spelling test of 50 words, what per cent should be marked on the paper?

10. If eggs are sold at \$.75 a dozen at a gain of 25%, find the cost.

XIII

[With pencil]

1. Find the proceeds of a 90-day note for $4000 written May 5 and discounted July 1 at 4%.

2. Find the duty on goods weighing 1200 lb. and worth $3720, at 1¢ per pound and 35% ad valorem.

3. If $\frac{2}{5}x-6=2$, find the value of x.

4. Find the contents of a cube 5 dm. long.

5. Find the cost of a piano listed at $650, less discounts of 40% and 5%.

6. The product of three numbers is 452,466. Two of the numbers are 189 and 63. Find the third number.

7. $\dfrac{\frac{1}{4}\div 2\frac{1}{2}}{4\frac{1}{2}+\frac{2}{3}\text{ of }\frac{3}{8}}=?$

8. A 2-month note for $850 is dated Feb. 5 and discounted Feb. 24 at 6%. Find the bank discount and the proceeds.

9. If a selling price of $7011 is 18% less than the cost of certain goods, what selling price is 18% more than their cost?

10. Find the cost of plastering the walls and the ceiling of a room 16 ft. wide, 18 ft. long, and 14 ft. high at $.27 a square yard.

XIV

[Without pencil]

1. Add 84, 53, 63, and 120.

2. From 200,000 take 20,000.

3. $637{,}794\div 9=?$

4. $\frac{3}{4}$ of 16, $\times 5$, -12, $\div 6=\frac{1}{5}$ of what number?

5. $40\div .008=?$

[With pencil]

6. What is the commission on a sale of $360 at $\frac{3}{4}\%$?

7. A boy weighs 40 kilograms. How many pounds does he weigh?

8. How much is $27 \times \$1.33\frac{1}{3}$?

9. By selling at a loss of \$80, I lose $16\frac{2}{3}\%$. What is the cost?

10. I buy a pound for \$.60, $\frac{1}{4}$ lb. at \$.40 a pound, and $1\frac{1}{2}$ doz. at 3 for 5¢. What change is due me from \$2?

XV

[Without pencil]

1. A violin was sold for \$60 and 25% was gained. What was the cost?

2. The regular price of a music box was \$30. I paid \$27. What was the rate of discount?

3. A stock of goods was sold for \$300, which was 60% of the value. What was the value?

4. The selling price was \$1.25; the cost was \$1. Find the rate of gain.

5. Find the area of a triangle whose base is 20 in. and whose altitude is 8 in.

[With pencil]

6. Find the bank discount and the proceeds of a note for \$2345, dated Nov. 13, due in 90 days, and discounted Dec. 10 at 5%.

7. My agent sold 500 bbl. of flour at \$10 a barrel and sent me a check for \$4750. What rate of commission did he charge?

8. Find the value of x if $2x+2x-4=16$.

9. What one discount is equivalent to two discounts of 10% and 10%?

10. Give the equivalent per cent: (*a*) $\frac{1}{16}$; (*b*) .00375.

XVI

[With pencil]

1. Mr. Henderson bought 400 overcoats at \$12 each. He sold 75% of them at a gain of 30% and the remainder at a loss of 20%. How much did he gain by the transaction?

2. Goods damaged by fire were sold at a loss of 12%. If the actual loss was $187.50, what was the selling price?

3. A farmer sold all his property for $4140, which was at a gain of 15%. How much did he gain?

4. Henry Hammond bought of Arthur Wilson the following bill of goods at discounts of 20% and 5%:

12 doz. erasers, circular, @ $1.20
20 doz. erasers, triangular, @ $.90
75 doz. erasers, typewriter, @ $.75

How much did he have to pay for the goods?

5. On May 13, 1921, I invested $825 at 4%. How much interest was due on Oct. 10, 1921?

6. $\frac{7}{8}x=35$. Find the value of x.

7. On a French weighing machine the index recorded Robert's weight as 70 Kg. How many pounds did he weigh?

8. A tank on a roof was 8 ft. wide, 10 ft. long, and 8 ft. deep. What was the weight of the water in that tank when full, if one cubic foot of water weighs $62\frac{1}{2}$ lb.?

9. A note for $650, dated Jan. 2, due in 2 mo., was discounted Jan. 8 at 6%. Find the proceeds.

10. If the quotient is 482 and the divisor is 281, what is the dividend?

XVII

[With pencil]

1. Write from dictation and add: 82,467.007, 947.0987, 528.4693, 7006.042, 897.508, 3279.3, .78, and 5.7.

2. Multiply 5346 by 809.

3. Divide 226.446 by 2.19.

4. Add $32\frac{1}{2}$, $5\frac{5}{6}$, $7\frac{3}{8}$, $4\frac{7}{12}$, and $92\frac{3}{4}$.

5. Multiply $5\frac{1}{2}\times\frac{4}{11}$ by $10\frac{3}{4}$, and divide the result by 43.

6. A box of 156 oranges is bought for $2.80. The oranges are sold at $.40 a dozen. Find the gain per cent.

7. A commission merchant sells 45 bbl. of apples at $2.80 a barrel, charging $.06 a barrel for storage and a commission of $5\frac{1}{2}\%$. Find the net proceeds of the sale.

8. Which is the better for the purchaser, and how much better, two successive trade discounts of 25% and 10% on a bill of $500, or a single discount of $33\frac{1}{3}\%$?

9. Find the proceeds of a 60-day note for $420, without interest, dated Aug. 29 and discounted at a bank five days later at 6%.

10. The duty on certain goods is $.22 a pound, plus 30% ad valorem. If the goods weigh 275 lb. and are worth $360, what is the total duty?

XVIII

[With pencil]

1. Write from dictation and add: 347.647, 30.289, 606.04, 129.003, 85.2, 1008.049, and 68.47.

2. Divide 63,817.2 by .311.

3. Write a negotiable note for $122.50, with yourself as maker and your teacher as payee. Make it payable 90 da. after date with interest at 5%. Date it to-day. Find the proceeds if it is offered for discount on the day the note is drawn, at 6%.

4. What is the weight of the water in an aquarium which is 1 ft. 4 in. long and 1 ft. wide, the water being 9 in. deep? (A cubic foot of water weighs $62\frac{1}{2}$ lb.)

5. Use short methods:

a. What is the total weight of 144 boxes of soap, each weighing $12\frac{1}{2}$ lb.?

b. At $\$.33\frac{1}{3}$ a yard, how many yards of canvas can a dealer buy for $135?

6. Use short methods:

a. If 25 tons of coal cost \$237.50, how much will a boatload of 300 tons cost?

b. Mileage on a railroad is $2\frac{1}{2}$¢. How much does a trip of 101 mi. cost a passenger who uses a mileage book?

c. If 300 buttons cost \$85.20, how much do 30 buttons cost at the same rate?

7. A Krupp gun has a diameter of 52 cm. and a range of 40 Km. What is the size and the range of the gun in our units of measurement?

8. In a certain geography textbook, the map of New Hampshire, which is triangular in shape, is drawn on a scale of 150 mi. to $1\frac{1}{4}''$. If the base of this triangle is $\frac{3}{4}$ in. and the altitude $1\frac{1}{2}$ in., find the area of the state.

9. When the city tax rate is \$2.32 per \$100, what tax will a man have to pay on property valued by the city at \$24,500?

10. On account of competition between steamship companies, at one time the steerage rate of \$40 from Holland to America was cut down to \$16. Find the per cent of decrease.

XIX

[With pencil]

1. Write from dictation and add: 247.006, 3947.0308, 506.0086, 949.3897, 8004.6, and 786.3058. (Time limit, 3 minutes.)

Work the following by the shortest methods you know:

2. Find the cost of 34,000 bricks at \$8 per M.

3. Find the cost of 18,000 envelopes at \$1.25 per C.

4. Find the cost of 6 doz. cans of tomatoes at $\$1.37\frac{1}{2}$ per dozen cans.

5. Divide 6126 by 600.

6. At \$465 per hundred, how much will 25 cost?

7. Multiply 46.007 by 3.8.

8. Divide:

a. The sum of 2.1 and 1.05 by 6.3.

b. $\frac{3}{5}$ plus $1\frac{2}{3}$ by $\frac{5}{7}$.

9. Find the proceeds of a note for \$625, due in 90 da., and discounted 30da. after it was issued, at 6%.

10. Find the cost of a piano listed at \$1250 less discounts of 20% and 10%.

XX [With pencil]

1. At 30*d*. per hour how much does a British workman earn in 6 da., working 8 hr. per day? (Give the answer in United States money, using the approximate normal value.)

2. A load of cotton damaged by fire is sold for \$1408, which is 78% less than its original value. Find its original value.

3. My agent collects $12\frac{1}{2}$% of a debt of \$4000 and charges 15% commission. How much do I get?

4. Pencils are listed at \$1.60 per gross, with discounts of 25% and 10%. Find the gain on 5 gross of pencils which are sold at \$.01$\frac{1}{2}$ each.

5. Find the tax on property assessed at \$20,000 if the tax rate is 2.19%.

6. Find the interest on \$5000 for 3 yr. 2 mo. 10 da. at $4\frac{3}{4}$%.

7. Draw a check for \$48.25 on the Milton Bank, payable to the order of your father.

8. Two boys, A and B, earn \$1.60. If A earns 3 times as much as B, how much does each earn?

9. Add the quotients of the following: .12÷3, .12÷.3, .012÷30, and .012÷300.

10. The area of a triangle is 400 sq. in. The base is 80 in. Find the altitude.

TABLES FOR REFERENCE

Review the following tables until you have learned them as thoroughly as is necessary for quick and accurate work in denominate numbers and in practical measurements.

Both in the classroom and at home make use of every opportunity to measure and use the units contained in the tables. Can you mark off the distance of one yard? one rod? one meter? Can you estimate the cubical contents of your classroom? of all the rooms in your house? Do you know the approximate capacity of such familiar objects as cups, jars, bottles, apple-boxes, flour-barrels, etc.? Can you estimate the area of the top of your desk or of the floor of your room? Do you know your own weight and can you estimate the weight of objects around you?

In olden times people did not have such accurate standards of measurement as we use to-day. Thus, they measured length by the thumb or the hand or the foot, weight by seeds, distance by a day's journey. At the present time denominate units are definitely fixed by scientific means. Thus, the standard unit of length is the yard, determined by the length of a pendulum which vibrates seconds in a vacuum at the level of the sea in the latitude of London. The meter was intended to be a ten-millionth part of the distance from the equator to either pole, but it differs slightly from this. In other words, units of measure that might vary greatly in value, such as the length of three barleycorns making an inch, the arm of King Henry I making the yard, the weight of a certain number of seeds making a carat or an ounce, the changes of the moon constituting a unit of time, the use of cattle as units of value, have gradually given way to standardized units of length, weight, time, and value which have definitely fixed values.

Note the interesting information regarding the origin of some of the units mentioned at the foot of the tables.

Liquid Measures

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
1 gallon = 231 cu. in.
31½ gal. = 1 barrel (bbl.)
63 gal. = 1 hogshead (hhd.)

Dry Measures

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)
1 bushel = 2150.42 cu. in.

The term *gill* originally meant drinking-glass. *Quart* came from the Latin *quartus*, meaning a quart. A pint of water weighs nearly one pound, hence the proverb, "A pint's a pound the whole world round."

Measures of Length

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5½ yards = 1 rod (rd.)
16½ feet = 1 rod
320 rods, 8 furlongs, 5280 feet, 1760 yards = 1 mile (mi.)
1 knot = 1.15 miles

We often write ′ for foot, and ″ for inch.
The knot is used in measuring distances at sea.

Measures of Surface

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)

Measures of Volume

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet = 1 cord

1 cubic yard of earth is considered a *load*.

Measures of Weight

(Avoirdupois)

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)
20 hundredweight = 1 ton (T.)
2240 pounds = 1 long ton (T.)

Avoirdupois weight is used in weighing all ordinary articles, except drugs, precious metals, jewels.

The long ton is used for measuring coal and in mining.

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
12 months (mo.), 52 weeks, 365 days = 1 year (yr.)
366 days = 1 leap year
100 years = 1 century

The units of this table were suggested by natural happenings, such as the rising of the sun, the changes of the moon, and the succession of the seasons.

Counting

12 things = 1 dozen (doz.)
12 dozen = 1 gross (gro.)
20 things = 1 score

Stationers' Table

24 sheets = 1 quire
20 quires = 1 ream

Federal Money

10 mills = 1 cent (¢)
10 cents = 1 dime
10 dimes, 100 cents = 1 dollar ($)

The present system was established by the Act of Congress in 1786 and was called Federal money because it was the money of the Federal Union in contrast with the different systems of currency that had existed in the various colonies. Federal money is a decimal system based upon the standard unit of a dollar. The mill is not coined.

English Money

4 farthings (far.)	= 1 penny (*d.*)
12 pence	= 1 shilling (*s.*)
20 shillings	= 1 pound sterling (£)
21 shillings	= 1 guinea

The normal value of a pound is $4.8665; of 1*s.*, $.243.

French Money

100 centimes (c.) = 1 franc (fr.)

The normal value of a franc is $.193.

German Money

100 pfennigs (pf.) = 1 mark (M.)

The normal value of a mark is $.238.

Metric System

Measures of Length

10 millimeters (mm.)	= 1 centimeter (cm.)
10 centimeters	= 1 decimeter (dm.)
10 decimeters	= 1 meter (m.)
10 meters	= 1 dekameter (Dm.)
10 dekameters	= 1 hektometer (Hm.)
10 hektometers	= 1 kilometer (Km.)

The primary unit of measures of length is the *meter*, which equals 39.37 in. 1 Km. = $\frac{6}{10}$ mi.

Measures of Surface

100 square millimeters (sq. mm.)	= 1 square centimeter (sq. cm.)
100 square centimeters	= 1 square decimeter (sq. dm.)
100 square decimeters	= 1 square meter (sq. m.)
100 square meters	= 1 square dekameter (sq. Dm.)
100 square dekameters	= 1 square hektometer (sq. Hm.)
100 square hektometers	= 1 square kilometer (sq. Km.)
1 square dekameter	= 1 are
100 ares	= 1 hektare (Ha.)
1 Ha.	= 2$\frac{1}{2}$ acres.

The primary unit of measures of surface is the *square meter*, which equals 1.196 sq. yd. 1 sq. Km. = nearly .4 sq. mi.

Measures of Volume

1000 cubic millimeters (cu. mm.) = 1 cubic centimeter (cu. cm.)
1000 cubic centimeters = 1 cubic decimeter (cu. dm.)
1000 cubic decimeters = 1 cubic meter (cu. m.)

The primary unit of measures of volume is the *cubic meter*, which equals about $1\frac{1}{3}$ cu. yd. It is the volume of a cube each edge of which is one meter in length.

Measures of Capacity

10 milliliters = 1 centiliter (cl.)
10 centiliters = 1 deciliter (dl.)
10 deciliters = 1 liter (l.)
10 liters = 1 dekaliter (Dl.)
10 dekaliters = 1 hektoliter (Hl.)

The primary unit of measures of capacity is the *liter*, which equals 1.0567 liquid quarts, or .908 dry quart. It is the volume of a cubic decimeter. 1 Hl. = about 2.84 bu.

Measures of Weight

10 milligrams (mg.) = 1 centigram (cg.)
10 centigrams = 1 decigram (dg.)
10 decigrams = 1 gram (gr.)
10 grams = 1 dekagram (Dg.)
10 dekagrams = 1 hektogram (Hg.)
10 hektograms = 1 kilogram (kilo)
1000 kilograms = 1 metric ton

The primary unit of measures of weight is the *gram*, which equals .035 oz. Av. It is the weight of 1 cu. cm. of water at its greatest density.

1 kilogram, which equals $2\frac{1}{5}$ lb., is the weight of 1000 cu. cm. of water or of 1 liter of water.



